

TABLE OF CONTENTS

	<u>Page</u>
REAL PARTY IN INTEREST	1
RELATED APPEALS AND INTERFERENCES	1
STATUS OF THE CLAIMS	1
STATUS OF AMENDMENTS	1
SUMMARY OF THE INVENTION	1
THE ISSUES	2
GROUPING OF CLAIMS	3
ARGUMENT AND DISCUSSION	3
SUMMARY AND CONCLUSION	15
APPENDIX A (CLAIMS)	
APPENDIX B (EP Patent No. 0113420 & translation)	
APPENDIX C (U.S. Patent No. 2,601,189)	
APPENDIX D (U.S. Patent No. 5,125,238)	
APPENDIX E (U.S. Patent No. 5,246,656)	
APPENDIX F (Declaration of R. Andreas Deibel Under 37 CFR 1.132)	

REAL PARTY IN INTEREST

The real party in interest is AUGUSTINE MEDICAL, INC. as assignee of the present application by an Assignment recorded in the United States Patent Office on February 23, 1990 at Reel 5244, Frame 0712.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF THE CLAIMS

Claims 20-39 are in the application.

Claims 20-23 and 25-39 are rejected.

Claim 24 is objected to.

Claims 20-23 and 25-39 are appealed.

STATUS OF AMENDMENTS

A Request For Reconsideration and a Notice of Appeal were submitted on 11 December 2000. An Advisory Action dated 12/22/00 indicated that the Request and an accompanying declaration had been considered.

SUMMARY OF THE INVENTION

Please refer to Figs. 1-5, and to the description at pages 7-9 and 13 for understanding of the inflatable cover disclosed and claimed in this application.

Construction details of the inflatable cover are set forth at page 8, line 23 - page 9, line 8. The cover includes a laminate base sheet in which an underside layer 50, such as a stratum of absorbent tissue paper, is "prelaminated" with a layer 52 of heat-sealable material, such as plastic. As mentioned at page 8, lines 25-27, the underside layer 50 should be "formed from a flexible material capable of bonding to a layer 52 of heat-sealable plastic." A specific example of such material is disclosed as being "commercially available in production rolls" useful "to make painters' drop cloths." (P. 8, l. 30 - P. 9, l. 1). One specific example of such material is "a stratum of absorbent tissue paper prelaminated with a layer of heat-sealable plastic." (P. 8, ll. 28-29). In this regard, "absorbent tissue paper" is but one example of "an underlayer of fibrous material".

The two ends of the laminate base sheet correspond to the head end 12 and foot end 14 of the inflatable device illustrated in Figs. 1 and 2. The two edges are clearly visible in Fig. 2. The base sheet has "a plurality of apertures" (P. 13, ll. 3-6). An "overlying sheet" is attached to the upper surface on the layer 52 of the base sheet as set forth at P. 9, ll. 2-6. The overlying sheet is attached to the upper surface of the base sheet at a plurality of locations within the periphery of the cover, such as the interrupted seams 54. Although the seams 54 form tubes, the invention is not so limited:

"It is also noted that the pattern of inflatable tubes can be replaced by other suitable patterns of communicating, inflatable chambers." P. 8, ll. 11-14.

As stated at P. 8, ll. 14-16, the tubes are merely a preferred embodiment of a representative structure. As the inventors note: "Other inflatable structures are contemplated . . .".

The overlying sheet is sealed to the upper surface of the base sheet near the periphery (the two ends and the two edges shown in Fig. 2) by edge seams 43, a foot-end seam 45, and, at the head end 12, by a continuous seam 40. (P. 7, ll. 25, 27). A non-inflatable portion of the inflatable structure is provided near the head end. (P. 7, l. 29 - P. 8, l. 1). There is an opening near the foot end 14 for admitting warmed air to the inflatable structure, the opening being represented by the inflation port 36 and the inflation cuff 16 illustrated in Fig. 2. Altogether, the opening, the inflatable structure, and the aperture support inflation of the cover by air and exhaustion of the air from the cover.

THE ISSUES

1. Whether Claims 20, 21, 22 and 34 are anticipated under 35 U.S.C. 102(b) by Roehr (EP 0113420 A1);
2. Whether Claims 23, 25, 26, 27, 28, 29, 30 and 31 are obvious under 35 U.S.C. 103(a) over Roehr;
3. Whether Claims 32 and 33 are obvious over U.S. Patent No. 4,572,188 ("Augustine '188) in view of Roehr;
4. Whether Claims 35 and 36 are obvious over Roehr in view of U.S. Patent No. 3,714,947 ("Hardy"); and
5. Whether Claims 37-39 are obvious over Augustine '188 in view of Roehr and Hardy.

GROUPING OF CLAIMS

The claims are grouped as follows:

Claims 20, 22, and 34 stand or fall together.

Claim 21 stands or falls alone.

Claims 23, 28 and 31 stand or fall together.

Claims 25-27, 29 and 30 stand or fall together.

Claims 32 and 33 stand or fall together.

Claims 35 and 36 stand or fall together.

Claims 37-39 stand or fall together.

ARGUMENT AND DISCUSSION

Claims 20, 21, 22 and 34

Claims 20, 21, 22 and 34 are rejected as being anticipated by EP 0113420 A1 (Roehr).

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The decision of *In re Robertson* 169 F.3d 743, 49 USPQ2d, 1949, 1950 (Fed. Cir. 1999) restates the principle that, to establish inherency, extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference..." *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ 2d 1746, 1749 (Fed. Cir. 1991). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Id.* at 1269, 20 USPQ2d at 1749.

The cover disclosed by Roehr has two layers (11, 111) welded together at their borders and within their borders to form inter-connected air duct-like sectors "to guide the air to the air exit openings (25) (Fig. 2)." (Roehr, Abstract of the translation). The layers of which the cover is made consist of "weldable plastic foil or of a fabric lined with plastic foil."

In Claims 20-22 and 34 an inflatable cover includes "a *laminate base sheet . . .*" that includes "an *underlayer of fibrous material*, and an *upper surface . . .*", and a "plurality of apertures" that open through the base sheet. An overlaying sheet is attached to the upper surface of the base sheet and sealed "near the periphery of the cover to form an *inflatable structure* comprising the overlaying sheet and the base sheet . . . ". (Italics added for

emphasis). As the applicants have explained in the prosecution history of this application, the original German version of Roehr and the English translation of Roehr have been searched for the terms "laminate" and "inflatable". According to the best of the applicants' knowledge, neither term is used by Roehr. However, both terms are explicitly recited in the rejected claims and are used according to their ordinary meaning in the specification. According to the law respecting anticipation, these limitations must be "inherently described" in Roehr. Further, to establish inherency, "extrinsic evidence" must be cited in order to "make clear that the missing descriptive matter is necessarily present" in the cover described in the Roehr patent.

In respect of a "laminate base sheet", the subject matter omitted by Roehr also includes an "underlayer" of "fibrous material" and an "upper surface". However, these elements and limitations are not recited separately in claim 20. It must therefore be established by extrinsic evidence that Roehr inherently describes a laminate base with an underlayer of a fibrous material and an upper surface; and, this omitted material must be described by Roehr in the same combination with the remaining elements, limitations, and relationships recited in claim 20.

So, somehow, Roehr's "two-layers, each of weldable plastic foil or of a fabric lined with plastic foil", and the rest of Roehr's specification must inherently describe "a laminate base sheet with an underlayer of fibrous material and an upper surface" to which an upper layer is attached to form an inflatable structure. It is submitted that this is not the case.

With respect to lamination, it was stated in the Office Action of 6/23/98:

" . . . the examiner considers it to be inherent that the fabric lined foil disclosed by Roehr means a foil wherein the fabric lined layer is that which would touch the patient which would be the only logical purpose of the fabric. Fabric oriented any other way would interfere with the welds in the blanket and would not serve any purpose. Regarding the 'laminated' limitation Roehr discloses a single layer of fabric lined foil not two separate layers."

This is not extrinsic evidence. It is, rather, a characterization of subject matter absent from Roehr that can only be understood with reference to the specification of *this* patent application. These comments are speculative and not supported by Roehr. Instead, Roehr simply says that his layers consist of "weldable plastic foil or of a fabric lined with plastic foil . . .". No further description regarding the orientation of the layers or regarding lamination is given that leads one to understand that Roehr inherently describes a "laminate base sheet" that includes "an underlayer of a fibrous material, and an upper surface . . .".

In the Final Action of 9/11/00, Moore (U.S. Patent No. 4,114,620) was introduced to support the Examiner's position "regarding the meaning of lined laminated plastic foil structures as known in the art." This asks too much of Moore. Moore does not teach a convective device made of "lined laminated plastic foil structures . . . ". Instead, Moore teaches a conductive device in which absorptive "panels" of fibers are intermittently surface bonded to thermoplastic "panels". Moore's product is a heavy duty patient treatment pad which lies underneath a patient and which is constructed in order to "bear the full weight of the patient as he shifts his weight and moves about on the pad . . . " (Moore, C. 1, ll. 23-25). Moore particularly distinguishes softer, more delicate fibrous materials, such as paper or the like, as being undesirable for the use to which his product is put, that is, to support a patient. See Moore at C. 1, ll. 25-30.

Further, Moore does not satisfy the limitations of the laminate base sheet that dispose the fibrous underlayer of the base sheet with respect to its upper surface and the overlaying sheet attached to that surface.

Finally, no matter which side of Moore's device is designated as a "base sheet" it is manifest that is not one which would include "a plurality of apertures opening through the base sheet", since the device is a pad for circulating water. Apertures would result in a one-way flow of water through the pad from a source onto a person. Clearly, Moore did not contemplate this.

In respect of "an inflatable structure", it was stated in the Office Action of 06/23/98:

"Roehr discloses a sealed envelope of flaccid material (plastic foil) into which air is pumped at varying pressure depending on what the user desires. Under such conditions it is inherent that what is being disclosed is an inflatable structure." (Office Action of 06/23/98, page 2.)

It was further argued in support of the rejection that "the applicant cannot point to any claimed structural feature not disclosed by Roehr. It is inherent that two identical combinations of elements constructed in the identical fashion will operate in an identical fashion." The argument concluded with the assertion that the fact that Roehr does not specifically recite "inflate" or "inflatable" is not dispositive on the issue (whether "the issue" is inherency or inflatability is not stated). The last statement made in support of the inherency of inflatability was the fact that Roehr provides a pressure release valve 31 which, according to the argument, "would not be necessary if the blanket was not inflatable".

Again, the argument in support of inherency reads Roehr using the applicants' specification as a road map. No extrinsic evidence is submitted to support the conclusions made about the inherent "inflatability" of Roehr. Characterization of plastic foil as "flaccid

material" is conclusory; there are stiff versions of such material used to construct airflow devices that are not "inflatable". See for example, U.S. Patent No. 2,601,189 of Wales which distinguishes "inflatable" air delivery devices from "non-inflatable", self-supporting airflow devices made of sponge, foam rubber or plastic.

Furthermore, with attention to Figs. 1 and 2 of Roehr, it is noted that the air exit openings 25 are large, having almost the same dimensions as the punctual welded or glued sections 41 and 42. In contrast, the apertures 62 in the base sheet of Claim 20 are shown in Fig. 5 to be very small; in the specification an exemplary size is "approximately 1/4 inch in length." (Specification, P. 14, l. 3). Large air exit openings such as those shown by Roehr would so deplete pressure within Roehr's structure as to make it difficult to inflate, if indeed it is inflatable. For this reason also it is possible that Roehr's plastic foil exhibits a self-supporting, non-inflatable structure. In this regard, Roehr's device would operate much as Wales'.

As to the suggestion that the elements recited in Claims 20-22 and 34 are identical with those recited in Roehr, it is noted that Roehr does not describe or illustrate "a laminate base sheet" having an "underlayer of fibrous material" and an upper surface with an overlaying sheet attached and sealed to the upper surface "to form an inflatable structure". Instead, one must refer to the applicants' specification to find these elements with these limitations and relationships. Finally, with respect to the release valve 31, it is noted that pressure relief is not necessarily indicative of inflatability. Indeed, steam boilers, which are *not* inflatable structures, have such elements.

As to Claim 21, the remarks distinguishing Claims 20, 22, and 34 apply. In addition, Claim 21 further limits Claim 20 by specifying that "the opening near a foot end for admitting warmed air to the inflatable structure" is "into the center of the inflatable structure." In this regard, "center" and "interior" are not synonymous. For example, the inflatable cover shown in FIG. 2 of this application has an inflation port 36 and an inflation cuff in a center tube 34. As shown in Roehr's FIG. 1, the "air supply connection piece 30" is not into the center of the cover; it is instead off-set to the right of the "longitudinal center line 61" of the cover.

Accordingly, Roehr does not anticipate Claims 20-22 and 34.

Claims 23 and 25-31

Claims 23 and 25-31 are rejected as obvious under 35 U.S.C. 103(a) over Roehr. In the 12/08/97 Office Action it was stated (regarding claims 23, 28, and 31) that the use of paper as a substitute for fabric in a disposable article is "commonly known", and that the use of a fabric

layer closest to the patient is "obvious" (claims 25-30). In the 06/23/98 Office Action, the Examiner stated that he was under no burden to establish that paper is a likely choice to an ordinarily skilled artisan.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

With respect to Claims 23, 28 and 31, there is no suggestion to modify Roehr in such a manner as to yield an inflatable cover in which a laminated base sheet includes an under layer of "paper". Roehr simply describes layers consisting of weldable plastic foil or a fabric lined with plastic foil. "Disposability" is not a factor in Roehr or in this application. This motivation is speculative, unfounded, and irrelevant. No other motivation is given. The Applicants therefore respectfully submit that Roehr has only been modified in retrospect, in light of the present invention. That is, the obviousness rejection is based upon modification of Roehr in light of the applicants' own technical description. The inventor's disclosure cannot be used as a blueprint for piecing together the prior art to defeat patentability, which is the essence of hindsight. *In re Dembiczak*, 175 F.3d 994, 999, USPQ2d 1614.

Further, there has been no demonstration that the modification of Roehr using a paper underlayer has any reasonable expectation of success.

With respect to the third requirement to support a *prima facie* case of obviousness, as noted in the response to the anticipation rejection, Roehr does not disclose all the elements of the claimed invention of Claim 20. Furthermore, Roehr does not describe the claimed invention which comprises an inflatable structure, a laminate base sheet, and a "paper" under layer in the base sheet. If, in stating that paper is a "commonly known" substitute for fabric, Official Notice has been taken to support the assertion that paper can be substituted for some element in Roehr's cover, an affidavit supporting such a position is required, if requested by the applicant. The right to request such an affidavit is clearly enunciated in *In re Ahlert* 424 F.2d 1088, 1091, 165 USPQ 418, 420-421 (CCPA 1970), CFR 1.104(d)(2), and summarized in MPEP 2144.03. The applicants requested such an affidavit in the Request For Reconsideration submitted 14

June 2000. To date, none has been submitted. Accordingly, no weight can be given to the Examiner's conclusion that paper can be substituted for fabric in Roehr's cover to yield the inflatable cover of Claims 23, 28, and 31.

Claims 25-27, 29 and 30, dependent from claim 20, also benefit from the above-mentioned distinctions between Roehr and the invention of claim 20. With respect to Claim 25, Roehr does not disclose, illustrate, or suggest a laminate base sheet with an "upper surface" of "plastic material" on an under layer of fibrous material. Roehr describes only "two layers welded or glued together" in which the layers consist of "weldable plastic foil or a fabric lined with plastic foil". Any structural relationship between these layers must be presumed or derived from the applicants' specification. Claim 26 further limits Claim 25, by specifying that "the opening" is "into the center of the structure". As discussed above, Roehr's "air supply connection piece 30" is not in the center of the cover; instead, it is offset to the right of the "longitudinal center line 61" of the cover. Claim 27 further limits Claim 25 by specifying that the inflatable structure "includes space between the overlaying sheet and the upper surface of the base sheet." There is no description, illustration, or suggestion of the order or orientation of any elements of the "two layers welded or glued together" in Roehr nor is there any description, illustration, or suggestion of "inflatable space". Claim 29 further limits Claim 25 by specification of the (laminate) base sheet as comprising "an upper layer of plastic material on the under layer" so that the upper layer is the upper surface. Again without specification, illustration, or suggestion of order or orientation, Roehr cannot teach or suggest the limitations of Claim 29. With respect to Claim 30, Roehr does not teach or suggest the limitation of the space of the "inflatable" structure to being between the overlaying sheet and the upper surface of the base sheet for reasons given in support of Claims 20, 25 and 29.

Accordingly the burden of establishing a *prima facie* case of obviousness with respect to Claims 23 and 25-31 has not been met.

Claims 32 and 33

Claims 32 and 33 are rejected as obvious under 35 U.S.C. 103(a) over Augustine '188, in view of Roehr.

There is no suggestion in Roehr, in Augustine, or in the prior art of record to make an inflatable device with an inflatable tubular or self erecting structure in which a laminate base sheet has a "fibrous" or a "paper" underlayer. Roehr does not have this suggestion for the reasons discussed above. Augustine's air flow cover is made entirely from plastic tubes.

In the Office Action of 12/8/97 the Examiner stated: "In view of Roehr it would have been obvious to one of ordinary skill in the art to have used a fibrous layer on Augustine's blanket for the purposes of comfort." There is, of course, no discussion in either Roehr or Augustine of "comfort" with respect to the composition of the underlayer of an inflatable cover. Indeed, it would appear that the notion of "comfort" accorded by a fibrous underlayer of an inflatable cover is an unexpected result of this invention. In fact, such a construction affords not only comfort, but also simplicity, economical assembly, and retention of an inflatable cover on a patient. In this regard, the Board's attention is respectfully drawn to U.S. Patent No. 5,125,238, cited in U.S. Patent No. 5,246,656, which is of record in this application.

It would appear that the notion of "comfort" with respect to a laminate base sheet may have been mined from the '238 patent. The '238 patent has a filing date of 29 April 1991, and an issue date of 30 June 1992, both dates occurring well after the first filing date of this application. In particular at C. 3, ll. 4-30, a laminate base sheet is described precisely as it is set out in the rejected claims. In this regard, a pneumatic blanket which is inflatable has a three layer construction wherein two layers form an air chamber and the third layer provides a "comfortable surface for contact with the patient." In the blanket, a flexible sheet of polyethylene is adhesively bonded to a layer of non-woven fibrous material forming a "laminate assembly 18, as shown in FIG. 2." As the '238 inventors point out, the "fibrous layer 16 provides a comfortable surface in contact with the patient and its high frictional characteristic helps keep the blanket in place on the patient." The passage goes on to specify that the "laminate assembly 18 is then perforated with specifically sized orifice holes 20 by means of a punch plate." Inflation of the structure is referred to throughout the specification of this patent. Besides detailing the many unexpected results achieved from the invention recited in the rejected claims, the '238 patent also evidences copying of the invention claimed in this application.¹

¹ The skilled practitioner and the '238 inventors were put in possession of the invention set forth in these claims by virtue of a publication of European Application No. 88309191.0, which claimed priority under the two earliest ancestors of this application, U.S. Serial Nos. 104,682, and 227,189. The publication of the European application occurred on 4/12/89; the filing date of the '238 patent was 29 April 1991; accordingly, the skilled practitioner, and the inventors of the '238 patent, had possession of the laminate base sheet with a fibrous underlayer. This placed the inventors of the '238 patent in a position not only to appreciate the benefits of the invention in the rejected claim, but also to copy it.

There is no statement or offer of evidence in the record as to how the combination of Augustine ('188) with Roehr points to a reasonable expectation of success with respect to the claimed invention.

With respect to the third *prima facie* requirement, claims 32 and 33, dependent from claim 20, benefit from the above-mentioned distinctions between the cited prior art claim 20. Further, neither Roehr nor Augustine teaches or suggests a "fibrous" or a "paper" under layer. The air flow cover of Augustine '188 is "made up of a plurality of parallel elongate plastic tubes, two of which are indicated by 15 and 16, interconnected to form an inflatable casing." These tubes are "joined together by an intermittent longitudinal seam 18." (See Augustine '188 at C. 3, ll. 16-35.). In other words, the tubes are made singly and then joined together to form an inflatable structure. In contrast, the inflatable structure of this application is characterized by an overlaying sheet sealed to the upper surface of a laminated base sheet "near the periphery of the cover to form an inflatable structure comprising the overlaying sheet and the base sheet . . . ". There are no sheets of material in Augustine '188 that can be adapted with any layer element of Roehr. In other words, the structure of Roehr's device which utilizes fabric lined plastic is so different from the Augustine '188 airflow cover in which parallel tubes are constructed and then joined, that the combination of Augustine '188 with Roehr fails to teach all elements of an inflatable or self-erecting structure as recited in Claims 32 and 33.

Accordingly, the burden of establishing a *prima facie* case of obviousness with respect to claims 32 and 33 has not been met.

Claims 35 and 36

Claims 35 and 36 are rejected as obvious under 35 U.S.C. 103(a) over Roehr in view of Hardy. In the Office Action of 12/08/97, the assertion was that it would have been obvious to modify Roehr's cover to provide a non-inflatable recess in view of Hardy. In the Office Action of 06/23/98 it was admitted that Hardy's opening is nothing but air. In the Office Action of 02/14/00, it was stated that Hardy provides a motivation to combine references, because such an advantage would have been apparent to one skilled in the art.

Roehr teaches a cover for individuals to be supplied either with warm air or with cold air. It is intended to be deployed over a person in a horizontal or a sitting position, with thermally treated air expelled through the cover onto the person. Hardy teaches an infant bunting for wrapping a baby. The bunting includes snap fasteners for adjusting the longitudinal size of the bunting to conform to different infant body sizes. The baby is warmed by heat conducted

through the bunting from the circulation of warmed liquid through a liquid channel disposed in the bunting.

In the rejected claims, there is a "non-inflatable portion defining a recess" in a inflatable structure. As the specification points out, and as the drawings illustrate, the purpose of the recess is to provide a care giver ease in observing the upper portion of a patient's body. (Specification, P. 6, ll. 16-20).

"Combining prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight." *In re Dembiczak*, 175 F.3d 994, 999, USPQ2d 1614. The Applicant respectfully submits that Roehr is only modified by Hardy in retrospect, in light of the specification of this application.

With respect to the first requirement of *prima facie* obviousness, Roehr shows a cover without any contour or element that defines a recess near an end. Roehr does not show a cover deployed on a person, so one cannot know what orientation it might have or what size it might be with respect to the person, and whether any part of the person might be obscured by it. Hardy's bunting is meant to receive and enclose an infant, like a papoose. Hardy describes and illustrates a bunting 20, having an "upper edge 23 with a downwardly curved center 24 where the neck of an infant within the bunting would be located . . .". This is the sole description of the structure of the "downwardly curved center 24", no explanation or illustration is given of its role in relation to the use of the bunting; there is no problem (of viewing a patient's head, neck or chest, for example) identified which the "downwardly curved center 24" solves. Accordingly, there is no suggestion to modify Roehr's cover with the contour of the bunting disclosed by Hardy. Further, there is no suggestion in either Roehr or Hardy that a warming cover for a horizontal or sitting person could be modified with a bunting in which an infant is wrapped to achieve a "non-inflatable portion defining a recess near a first end".

Hardy's structure is not inflatable, and does not include any "non-inflatable portion defining a recess" in an inflatable device. The Examiner states that Hardy provides motivation, in that it would have been apparent to a skilled artisan to combine air and fluid thermal references. This is a conclusion, unsupported by reasoning. If the Examiner is correct in his conclusion, however, there must be some features in the Hardy invention which the Examiner can describe which suggest a reason to combine the Hardy invention with Roehr to yield the "non-inflatable portion" which defines a recess. There is an edge with a seam in Hardy's bunting that follows the outline of the cutout, but there is no "non-inflatable" element that

defines the recess. Such an element is described in the specification of this application, illustrated in the drawings, and explicitly recited in these rejected claims.

As is plainly stated in MPEP 2143.01, the fact that references can be combined does not demonstrate a motive to combine *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Likewise, the fact that a modification would be within the ordinary skill of the art is not proof of motivation *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). Therefore, with respect to the first *prima facie* obviousness requirement, it is not readily apparent how a non-inflatable thermal device such as Hardy's bunting could suggest modifications to an inflatable thermal device such as recited in Claims 35 and 36. Further, it is not readily apparent how a recess in a liquid-charged, conductive thermal device could suggest a non-inflatable portion defining a recess in an air-driven, convective distribution device.

No explanation of a reasonable expectation that the combination of Roehr with Hardy would be successful has been entered by the Examiner.

The combination of cited prior art references also fails the third requirement of *prima facie* obviousness. Roehr does not teach a "flexible, multiple-layer base sheet with a fibrous underlayer and an upper surface". Further, there is no evidence to support the assumption that Roehr discloses an inflatable structure as recited in the claimed invention. The prior art in the '189 patent recognizes a distinction between "inflatable" and "non-inflated" air distributing covers, and the word "inflation" never appears in the Roehr patent. Roehr does describe a cover made for the purpose of distributing air, which has been heated or cooled. Roehr provides a general description of apertures and welds to accomplish this distribution. In addition, Roehr describes a warm air generating device 70 with a blower 75 to "...suck in air through the housing opening 72a which is then pushed into the interior 13 of the cover 10..." (pg. 6, sixth paragraph). However, at no point does Roehr provide a description of a cover with a combination of apertures, pressure, or a structure which causes the cover to inflate. Roehr simply fails to describe an inflatable structure as recited in the claimed invention. Roehr also does not teach or suggest a "non-inflatable portion" that defines a recess "near a first end" of his cover.

In the second full paragraph on page 4 of the Final Action of 09/11/00, the statement was made that "Hardy's device is clearly inflatable." The applicant respectfully disagrees and has requested a reference to any passage in Hardy that establishes this fact. The paragraph goes on to say that, nevertheless, "this is not the point of rejection. Hardy has been cited to show that it is known in the art to provide a recess in the *blanket* head portion. Such a recess

is by definition non-inflatable. It would have been obvious to have provided such a recess in Roehr's blanket as well to accommodate the head." (*Italics added for emphasis*). In addition to the arguments already presented traversing this rejection, it is noted that the inflatable cover of Claims 35 and 36 include "a non-inflatable portion defining a recess near a first end of the inflatable structure . . ." (Claim 35), where "the non-inflatable recess is defined by a seal near the head end that seals the upper sheet to the base sheet at the head end," (Claim 36). Hardy's device is a bunting that is meant to hold, contain, and/or completely enclose an infant, much like a papoose. It is not a blanket; it is not inflatable; it is not an "inflatable cover"; it does not have an "inflatable structure". It does not have "non-inflatable portion that defines a recess" and does not have "a seal near the head end" that defines the recess. Roehr has no "recess" and has not designated a "head end". Roehr's cover is not shown in deployment with respect to any person so it cannot be said there is any suggestion to modify Roehr by provision of a Hardy viewing recess, inflatable or non-inflatable.

Accordingly, the burden of establishing a *prima facie* case of obviousness with respect to Claims 35 and 36 has not been met.

Claims 37-39

Claims 37-39 are rejected as obvious under 35 U.S.C. 103(a) over Augustine ('188) in view of Roehr and Hardy for reasons set forth in the earlier applications of Roehr and Hardy to claims 35 and 36.

With respect to the first *prima facie* requirement, argument is presented above that there is no motivation to combine Augustine ('188) with Roehr, or Roehr with Hardy. There has been no demonstration of reasonable expectation of success. Moreover, the combination of Augustine's tubular structure, with Roehr's air distribution system and Hardy's fluid thermal system, fails to teach or suggest all elements of the inflatable structure of the claimed invention of claim 35. Claims 37-39, dependent from claim 35 also benefit from the above-mentioned distinctions.

The specific disposition of layers of the base sheet with respect to each other and to the overlaying material sheet that is recited in the rejected claims is not inherent in Roehr. The Examiner disagrees, as the record clearly sets forth. Nevertheless, in support of the contention that the specific orientation of the layers of the base sheet with respect to each other and to the overlaying material sheet is supported by Roehr, it was stated in the Final Action:

"Applicant's next argument is non-sensical. The examiner's position regarding the location of the fabric layer in Roehr is consistent. Whether stated as located where it touch the patient or stated on the outside of the foil where it will not interfere with the plastic welds the location is the same. The only confusion appears to be on the part of the applicant. If such confusion remains the applicant is urged to contact the examiner for clarification." (Final Action, 09/11/00, P. 3.).

In the paragraph of the Final Action beginning at the bottom of page 3 and extending to the top of page 4, the observation is made that the "greater degree of comfort that a fibrous layer provides for patient" is held to be "knowledge generally available to one of ordinary skill in the art." This has been acknowledged above with the qualification that such became known only after this invention was comprehended by the public. Reference to the specification at page 8, line 23 - page 9, line 8, together with evidence introduced into patent application serial no. 08/386,324 (Declaration R. Andreas Diebol, and accompanying video tape) establish that the disposition of the respective layers or strata of the base sheet also give rise to an unexpected result in the form of a method by which the overlaying sheet can be quickly and effectively attached to the base sheet to support mass manufacturing. For the Board's convenience, a copy of the Diebol declaration is submitted herewith; the video that accompanies that declaration is the file of the '324 application, which well known and available to the examiner.

Accordingly, the burden to establish a prima facie case of obviousness with respect to Claims 37-39 has not been met.

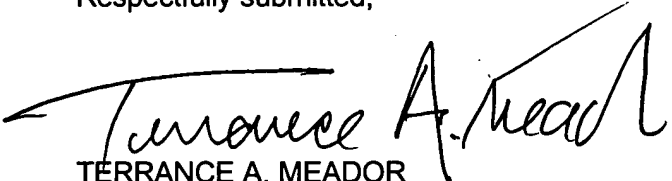
SUMMARY AND CONCLUSION

It is submitted that for the reasons pointed out above, the claims in the present application clearly and patentably distinguish over the cited references. Accordingly, the Examiner should be reversed and ordered to pass the case to issue.

A check in the amount of \$155.00 is enclosed to cover the fee for this Appeal Brief. Authorization is given to charge any deficit or credit any excess to Deposit Account No. 07-1895.

Respectfully submitted,

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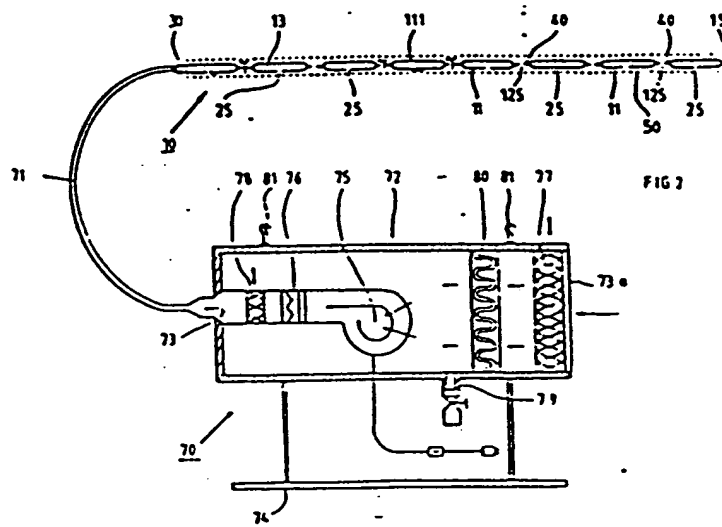
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⑤④ Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen.

⑤⑦ Die Erfindung betrifft eine Bedeckung für Personen, um diesen wahlweise Warmluft oder Kaltluft zuführen zu können, wobei für einen gleichmäßigen Luftaustritt die an eine Warmluft und/oder Kaltluft erzeugende Einrichtung (70) angeschlossene Decke (10) mit einer Anzahl von Luftaustrittsöffnungen (25) versehen ist, während im Innenraum der aus zwei randverschweißten Lagen (11,111) bestehenden Decke (10) mittels Schweiß- oder Klebabschnitten eine Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten (21) zur Luftführung zu den Luftaustrittsöffnungen (25) ausgebildet ist (Fig. 2).

EP 0 113 420 A1



Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen

Die Erfindung betrifft eine Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen.

- 5 Zum Schutz gegen eine Abkühlung des menschlichen Körpers ist die Verwendung elektrisch beheizbarer Bedeckungen in Form von Schlaf- oder Bettdecken bekannt, die jedoch den Nachteil besitzen, daß eine trockene Wärme erzeugt wird, die oftmals zu einer erhöhten Schweißabsonderung führen kann
- 10 und sich z.B. bei in einem Krankenhaus- oder Klinik-Bett liegenden Patienten insofern als nachteilig auswirkt, als trotz der Wärmezufuhr die Wärme als unangenehm empfunden wird, wobei auch noch das Sicherheitsproblem derartig elektrisch beheizbarer Decken hinzu kommt, auch wenn diese
- 15 Decken mit Überhitzungsthermostaten und -schaltern ausgerüstet sind, die bei Erreichen einer bestimmten Temperatur die weitere Stromzufuhr unterbrechen sollen. Hinzu kommt noch, daß derartige beheizbare, wärmeabgebende Decken technisch nicht so ausgebildet sind, daß auch Kühlluft ab-
- 20 gegeben werden kann, wenn dies erforderlich sein sollte.

- Die Erfindung löst die Aufgabe, eine Einrichtung zu schaffen, die eine Bedeckung in Form einer Decke für liegende oder sitzende Personen und eine Warmluft- und/oder Kaltluft-erzeugungseinrichtung umfaßt, mittels der keine trockene
- 25 Warmluft, sondern erwärmte Normalluft der Decke und somit der Person zugeführt wird und die auch geeignet ist, Kaltluft abzugeben, wenn eine Kühlung der betreffenden Person erforderlich ist, so daß die Bedeckung bei entsprechender Ausgestaltung auch zu Heilzwecken herangezogen werden kann.
- 30 Des weiteren soll erreicht werden, daß eine gleichmäßige Beaufschlagung der Person durch Luft erfolgt und die Ausbildung eines Überdruckes im Zwischenraum zwischen Decke und dem Körper der Person vermieden wird.

Zur Lösung der Aufgabe wird erfindungsgemäß eine Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen vorgeschlagen, die aus

- 5 a) einer doppelwandigen Decke aus zwei im Randbereich durch Schweiß- oder Klebverbindungen unter Ausbildung eines geschlossenen Innenraumes zusammengehaltenen Lagen aus schweißbarer Kunststoffolie oder einem mit einer Kunststoffolie kaschierten Gewebe, die unter Ausbildung eines Warm- oder Kaltluft führenden Kanalsystems
10 aus einer Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten in dem Deckeninnenraum abschnittsweise bzw. punktartig über Schweiß- oder Klebabschnitte miteinander verbunden sind, wobei eine oder beide Lagen mit Luftaustrittsöffnungen und der Deckeninnenraum
15 mit einem im Randbereich der Decke oder an einer der beiden Lagen befestigten Luftzuführungsstutzen versehen ist,
- b) einer Anzahl von Luftdurchtrittsdurchbrechungen in den Schweiß- und Klebeabschnitten und
- 20 c) einer mit dem Innenraum der Decke über einen mit dem Luftzuführungsstutzen verbundenen Luftzuführungsschlauch verbundenen Warm- oder Kaltluftherzeugungs- und Zuführungsvorrichtung aus einem mit einem Standgestell und/oder einer Aufhängung versehenen Gehäuse, in dessen Innenraum
25 ein Saug-Druck-Gebläse, eine im Bereich der Luftaustrittsöffnung des Gehäuses liegende Heizeinrichtung und mindestens ein Reinigungs- und/oder LuftbefeuchtungsfILTER und/oder ein Sauerstoff- bzw. Mischgaszuführungsstutzen und/oder ein Kühlaggregat im Bereich der Luftansaugöffnung
30 angeordnet sind,
- besteht.

Des weiteren sieht die Erfindung eine Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen vor, die aus

- 35 a) einer doppelwandigen Decke aus zwei im Randbereich durch Schweiß- oder Klebverbindungen unter Ausbildung eines geschlossenen Innenraumes zusammengehaltenen

Lagen aus schweißbarer Kunststoffolie oder einem mit einer Kunststoffolie kaschierten Gewebe, die unter Ausbildung eines Warm- oder Kaltluft führenden Kanalsystems aus einer Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten in dem Deckeninnenraum abschnittsweise bzw. punktartig über Schweiß- oder Klebabschnitte miteinander verbunden sind, wobei eine oder beide Lagen mit Luftaustrittsöffnungen und der Deckeninnenraum mit einem im Randbereich der Decke oder an einer der beiden Lagen befestigten Luftzuführungsstutzen versehen ist,

- b) einer Anzahl von Luftdurchtrittsdurchbrechungen in den Schweiß- und Klebeabschnitten und
- c) einer die doppelwandige Decke allseitig umgebenden Hülle aus einem luftdurchlässigen und luftverteilenden Gewebe und
- d) einer mit dem Innenraum der Decke über einen mit dem Luftzuführungsstutzen verbundenen Luftzuführungsschlauch verbundenen Warm- oder Kaltluftherzeugungs- und Zuführungsvorrichtung aus einem mit einem Standgestell und/oder einer Aufhängung versehenen Gehäuse, in dessen Innenraum ein Saug-Druck-Gebläse, eine im Bereich der Luftaustrittsöffnung des Gehäuses liegende Heizeinrichtung und mindestens ein Reinigungs- und/oder LuftbefeuchtungsfILTER und/oder ein Sauerstoff- bzw. Mischgaszuführungsstutzen und/oder ein Kühltagegagat im Bereich der Luftansaugöffnung angeordnet sind,

besteht.

Mit einer derart ausgebildeten Einrichtung ist es möglich, der die Decke der Einrichtung benutzenden Person wahlweise Warmluft oder Kaltluft vermittels des mit der Decke verbundenen Gebläses mit einer Heizeinrichtung zuzuführen. Im Körperbereich wird dann keine trockene Warmluft erzeugt, wie bei den bekannten, elektrisch beheizbaren Decken, sondern eine Warmluft, die ein gewisses Maß an Luftfeuchtigkeit aufweist, deren Höhe sich jeweils nach der Luftfeuchtigkeit

der Umgebungsluft richtet, von der die Luft zur Warmlufterzeugung entnommen wird, wobei auch eine zusätzliche Befeuchtung der zugeführten Luft vorgenommen werden kann. Bei Nichtinbetriebnahme der Heizeinrichtung der Warmlufterzeugungsvorrichtung wird über das Gebläse Kaltluft der Decke zugeführt. Ist die Warmlufterzeugungsvorrichtung mit mehreren Anschlußstutzen versehen, so können mit einer einzigen Warmlufterzeugungsvorrichtung mehrere Decken mit Warmluft oder bei abgeschalteter Heizeinrichtung mit Kaltluft versorgt werden. In Verbindung mit einem die Decke umhüllenden Bezug aus einem geeigneten Gewebe ist ein einwandfreier Luftdurchtritt durch das Gewebe bei gleichzeitiger gleichmäßiger Luftverteilung gewährleistet. Die aus der Decke austretende Luft verteilt sich gleichmäßig zu beiden Seiten der Decke in den Zwischenräumen zwischen der Decke und der Hülle bzw. dem Bezug.

Der Anwendungsbereich einer derart ausgebildeten Einrichtung erstreckt sich auf die verschiedensten Möglichkeiten. Neben der Verwendung der Wärmedecke in Haushalten findet die Einrichtung auch Verwendung in Krankenhäusern und Kliniken, in denen Patienten oftmals einer besonderen Wärmezufuhr bedürfen, da die Krankenzimmer nicht übermäßig erwärmt werden und insbesondere ältere Patienten ein besonders ausgeprägtes Wärmeverlangen haben.

Darüber hinaus ist es auch möglich, im Bedarfsfalle den Patienten Kaltluft zuzuführen, was besonders vorteilhaft an sehr warmen Tagen ist und eine Kühlung oftmals zu einer Verbesserung des allgemeinen Wohlbefindens und darüber hinaus auch in bestimmten Fällen, wie bei Verbrennungen, zu einer Linderung beiträgt. Wird die Decke bei entsprechender Formgebung, z.B. als Hülle oder als kleines Kissen, verwendet und wird dann der Decke gekühlte Luft zugeführt, so kann die Decke zur Unterstützung eines Heilungsprozesses dienen und zur lokalen Behandlung am Körper herangezogen werden, z.B. in der Ausgestaltung als Hülle um die Füße eines Patienten gelegt als Ersatz für einen Wadenwickel

oder als kleines Kissen auf die Brust in der Herzgegend gelegt zur Linderung von Herzbeschwerden.

Des weiteren läßt sich die Einrichtung in warmen Gegenden mit tropisch heißem Klima zur Kühlung von Personen anwenden und eine kostspielige Klimaanlage mit hohen Betriebskosten dadurch ersetzen. Bei unterkühlten Personen findet die Einrichtung mit Warmluftzufuhr Anwendung.

Vorteilhafte Weiterbildungen der Erfindung sind in den Unteransprüchen beschrieben.

Im folgenden wird der Gegenstand der Erfindung in den Zeichnungen erläutert. Es zeigt

Fig. 1 in einer Ansicht von oben eine aus einer Decke und einer Warmlufterzeugungsvorrichtung bestehende Einrichtung,

Fig. 2 einen senkrechten Schnitt gemäß Linie II-II in Fig. 1 und

Fig. 3 in einer schaubildlichen Seitenansicht eine zu einem Schlafsack oder Hülle umgewandelte Decke.

Die in Fig. 1 und 2 dargestellte Einrichtung besteht aus einer Decke 10 und einer Warmlufterzeugungsvorrichtung 70.

Die Decke 10 ist doppelwandig ausgebildet und besteht aus zwei Lagen 11, 111 aus vorzugsweise rechteckförmigen Zugschnitten aus schweißbarer Kunststoffolie oder einem mittels einer Kunststoffolie kaschierten Gewebe. Die beiden Lagen 11, 111 sind im Bereich ihrer umlaufenden Ränder 12 miteinander verschweißt oder verklebt. Die Randschweiß- oder Klebverbindung ist bei 15 angedeutet (Fig. 1).

Die Decke 10 kann auch aus einem einzigen, rechteck-

förmigen Zuschnitt bestehen, der mittig und quer zu seiner Längsrichtung gefaltet ist, so daß die beiden Zuschnittshälften aufeinander zu liegen kommen und so die beiden Lagen 11,111 bilden, die dann in einem Deckenendbereich
5 über die Faltlinie miteinander verbunden sind, während die drei verbleibenden Ränder 12a,12b,12c miteinander verschweißt oder verklebt sind.

Die beiden miteinander randverschweißten oder randverklebten Lagen 11,111 umschließen einen Innenraum 13 und sind
10 unter Ausbildung eines Warm- oder Kaltluft führenden Kanalsystems 20 aus einer Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten 21 in dem Innenraum 13 abschnittsweise, was in Fig. 1 bei 41 angedeutet ist, oder punktartig, wie bei 42 angedeutet, über Schweiß- oder Klebabschnitte
15 40 miteinander verbunden. Die punktartigen Schweißstellen können als scheibenartige Schweißabschnitte 42a ausgebildet sein; jedoch können auch andersartig ausgebildete Schweißabschnitte, die bei 41a angedeutet sind, zur Verbindung der beiden Lagen 11,111 und zur Ausbildung des Warm- oder
20 Kaltluft führenden Kanalsystems 20 dienen. Diese Schweißabschnitte 40 sind zueinander versetzt angeordnet, so daß die durch den Innenraum 13 der Decke 10 geführte Luft durch den gesamten Deckeninnenraum 13 hindurchströmen kann. Auch hier ist vorteilhafterweise eine versetzte Anordnung und
25 Zuordnung der Verbindungsstege vorgesehen.

Die Zufuhr von Warm- oder Kaltluft in den Innenraum 13 der Decke 10 erfolgt über einen Luftzuführungsstutzen 30, der über eine flexible Schlauchleitung 71 mit der Warmlufterzeugungsvorrichtung 70 verbunden ist.

30 Um die in den Innenraum 13 der Decke 10 zugeführte Warm- oder Kaltluft der mit der Decke 10 bedeckten Person zuführen zu können, weist die Lage 11 oder beide Lagen 11,111 im Bereich der luftkanalartigen Abschnitte 21 Luftaustrittsöffnungen 25 auf, die über die gesamte Fläche der Lage
35 11 und/oder der beiden Lagen 11,111 verteilt sind. Um den

Luftaustritt durch die Luftaustrittsöffnungen 25 in keiner Weise zu schmälern, sind die Luftaustrittsöffnungen 25 benachbart bzw. im Bereich der Schweiß- oder Klebabschnitte 40 vorgesehen (Fig. 1).

- 5 Wie Fig. 2 zeigt, weisen die Schweißabschnitte 40 Durchbrechungen 125 auf, durch die die aus den Öffnungen 25 austretende Luft gleichmäßig über die Oberfläche der Decke 10 verteilt wird. Dies ist besonders vorteilhaft, wenn die Decke 10 nur in ihrer Lage 11 Luftaustrittsöffnungen 25
- 10 aufweist und von einer Hülle 50 umgeben ist. Die aus den Öffnungen 25 austretende Luft strömt durch die Durchbrechungen 125 auf die Oberseite der Decke 10 und verteilt sich hier gleichmäßig zwischen der Decke 10 und dem oberen Hüllenabschnitt, so daß ein guter Erwärmungs- oder Kühleffekt erreicht
- 15 wird. Außerdem tragen die Durchbrechungen 125 zur Vermeidung eines Unterdruckes zwischen der Decke 10 und dem Körper der die Decke benutzenden Person bei.

- In dem Warm- oder Kaltluftzuführungsstutzen 30 bzw. in dem Verbindungsschlauch 70 kann zusätzlich ein Sicherheitsventil 31 vorgesehen sein, um zu vermeiden, daß sich
- 20 im Innenraum 13 der Decke 10 ein Überdruck bilden kann.

- Der Warm- oder Kaltluftstutzen 30 ist an einer der beiden Lagen 11 oder 111 oder im Randbereich 12 der Decke 10 angeschlossen, so wie dies in Fig. 1 und 2 dargestellt
- 25 ist.

- Um eine gleichmäßige Luftmengenverteilung im Deckeninnenraum 13 zu erreichen, ist benachbart zum umlaufenden Rand 12 an der die Luftaustrittsöffnungen 25 aufweisenden Lage 11 und/oder den Lagen 11,111 ein luftaustrittsöffnungs-
- 30 freier Abschnitt 16 ausgebildet, durch den die einströmende Luft ungehindert hindurchströmen kann, um von dort aus dann in den Bereich der Luftaustrittsöffnungen 25 zu gelangen, durch die dann die Luft entweichen kann. Vorzugsweise sind die beiden Lagen 11,111 im Bereich des luftaus-
- 35 trittsöffnungsfreien Abschnittes 16 nicht über Schweiß- oder Klebabschnitte 40 miteinander verbunden, so daß die

Luft ungehindert durch diesen Abschnitt 16 hindurchströmen kann.

Die Decke 10 findet auch als Einziehdecke in einem Überzug Verwendung bzw. ist mit einer Hülle 50 versehen (Fig. 2).

- 5 Diese Hülle 50 besteht aus einem luftdurchlässigen Gewebe, damit die aus den Luftaustrittsöffnungen 25 ausströmende Luft an den Körper der die Decke benutzenden Person gelangen kann. Hierzu sind auch handelsübliche Decken oder Kissenbezüge geeignet.
- 10 Um die Decke 10 auch als Schlafsack oder Umhüllung benutzen zu können, ist die Decke 10 mit einem oder mehreren Reißverschlüssen, Klettenverschlüssen od. dgl. 60, 60a, 60b versehen, wobei sich die Reißverschlüsse über zwei oder drei aneinandergrenzende Randbereiche der Decke 10 erstrecken,
- 15 so daß eine Einschlupföffnung bzw. zwei Öffnungen verbleiben.

Um aus der Decke 10 einen Schlafsack 100 entsprechend Fig. 3 zu bilden, wird die Decke 10 um ihre Längsmittellinie 61 so gefaltet, daß die beiden Deckenhälften 10a, 10b aufeinander zu liegen kommen. Hierauf wird dann die offene Längs-

20 seite und der bodenseitige Bereich mittels der Reißverschlüsse oder anderen geeigneten Verbindungsmitteln geschlossen. Auf diese Weise können auch Hüllen geschaffen werden, um Gliedmaße, wie Arme und Beine, zu umschließen.

Die Warmlufterzeugungsvorrichtung 70 besteht nach Fig. 2

25 aus einem mit einem Standgestell 74 oder einer Aufhängung 81 versehenen Gehäuse 72 mit einer Luftansaugöffnung 72a und einem Luftaustrittsstutzen 73, an den der Verbindungsschlauch 71 der Decke 10 angeschlossen ist. In dem Innenraum des Gehäuses 72 ist ein Gebläse 75 derart angeordnet, daß von diesem

30 durch die Gehäuseöffnung 72a Luft angesogen und über den Verbindungsschlauch 71 in den Innenraum 13 der Decke 10 gedrückt wird.

Im Innenraum des Gehäuses 72 der Warmlufterzeugungseinrich-

tung 70 ist ferner im Bereich der Luftaustrittsöffnung 72a eine Heizvorrichtung 76 in Form einer Heizspirale od.dgl. angeordnet, vermittels der die angesogene Luft erwärmt bzw. aufgeheizt wird. Der Heizvorrichtung 76 ist ein Luft-
5 befeuchtungsfilter 78 nachgeschaltet, über den die durchströmende Luft befeuchtet wird, falls dies erforderlich sein sollte. Ein oder mehrere weitere Filter 77 können als Luftreinigungsfilter noch in dem Gehäuse 72 untergebracht sein. Alle Filter 77,78 sind als auswechselbare
10 Einschubkassetten ausgebildet, um das Auswechseln der Filter zu erleichtern. An dem Gehäuse 72 ist ebenfalls ein Stutzen 79 angebracht, um der Gebläseluft Sauerstoff oder andere gasförmige Medien beizumischen.

Die Geschwindigkeit des Gebläses, Lüfters oder Ventilators
15 75 und auch die Heizvorrichtung 76 ist stufenlos regelbar. Ist die Heizvorrichtung 76 nicht eingeschaltet, so wird von dem Gebläse Kaltluft, d.h. Luft mit der Temperatur der Umgebungsluft, angesogen und der Decke 10 zugeführt. Mit einem eingebauten Kühlaggregat läßt sich die Temperatur
20 noch herabsetzen.

Sowohl die Warmlufterzeugungseinrichtung als auch die Kaltlufterzeugungseinrichtung können in gesonderten Bauteilen untergebracht sein, die baukastenartig vermittels an sich bekannter Befestigungsmittel miteinander verbunden
25 werden können, so daß mit einem Gerät wahlweise Warmluft und Kaltluft erzeugt werden kann. Die Unterbringung der Warmlufterzeugungseinrichtung und der Kaltlufterzeugungseinrichtung in getrennten Bauteilen erbringt den Vorteil, daß wahlweise das eine oder das andere Bauteil einzeln
30 verwendet werden kann.

1

Patentansprüche

1. Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen, dadurch gekennzeichnet, daß die Einrichtung aus

- 5 a) einer doppelwandigen Decke (10) aus zwei im Randbereich (12; 12a, 12b, 12 c) durch Schweiß- oder Klebverbindungen (15) unter Ausbildung eines geschlossenen Innenraumes (13) zusammengehaltenen Lagen (11, 111) aus schweißbarer Kunststoffolie oder einem mit einer
- 10 Kunststoffolie kaschierten Gewebe, die unter Ausbildung eines Warm- oder Kaltluft führenden Kanalsystems (20) aus einer Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten (21) in dem Deckeninnenraum (13) abschnittsweise (41) bzw. punktartig (42)
- 15 über Schweiß- oder Klebabschnitte (40) miteinander verbunden sind, wobei eine (11) oder beide Lagen (11, 111) mit Luftaustrittsöffnungen (25) und der Deckeninnenraum (13) mit einem im Randbereich der Decke (10) oder an einer der beiden Lagen (11, 111) befestigten Luftzuführungsstutzen (30) versehen ist,
- 20 b) einer Anzahl von Luftdurchtrittsdurchbrechungen (125) in den Schweiß- und Klebeabschnitten (40) und
- c) einer mit dem Innenraum (13) der Decke (10) über
- 25 einen mit dem Luftzuführungsstutzen (30) verbundenen Luftzuführungsschlauch (71) verbundenen Warm- oder Kaltluftherzeugungs- und Zuführungsvorrichtung (70) aus einem mit einem Standgestell (74) und/oder einer Aufhängung (81) versehenen Gehäuse (72), in dessen
- 30 Innenraum ein Saug-Druck-Gebläse (75), eine im Bereich der Luftaustrittsöffnung (73) des Gehäuses (72) liegende Heizeinrichtung (76) und mindestens ein Reinigungs- und/oder LuftbefeuchtungsfILTER (77, 78) und/oder ein Sauerstoff- bzw. Mischgaszuführungsstutzen (79) und/oder ein Kühlaggregat (80)
- 35 im Bereich der Luftansaugöffnung (73a) angeordnet sind,

besteht.

2. Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen, dadurch gekennzeichnet, daß die Einrichtung aus

- 5 a) einer doppelwandigen Decke (10) aus zwei im Randbereich (12; 12a, 12b, 12 c) durch Schweiß- oder Klebverbindungen (15) unter Ausbildung eines geschlossenen Innenraumes (13) zusammengehaltenen Lagen (11, 111)
10 aus schweißbarer Kunststoffolie oder einem mit einer Kunststoffolie kaschierten Gewebe, die unter Ausbildung eines Warm- oder Kaltluft führenden Kanalsystems (20) aus einer Vielzahl von miteinander verbundenen luftkanalartigen Abschnitten (21) in dem Deckeninnenraum (13) abschnittsweise (41) bzw. punktiert (42)
15 über Schweiß- oder Klebabschnitte (40) miteinander verbunden sind, wobei eine (11) oder beide Lagen (11, 111) mit Luftaustrittsöffnungen (25) und der Deckeninnenraum (13) mit einem im Randbereich der Decke (10) oder an einer der beiden Lagen (11, 111) befestigten Luftzuführungsstutzen (30) versehen ist,
20 b) einer Anzahl von Luftdurchtrittsdurchbrechungen (125) in den Schweiß- und Klebeabschnitten (40) und
c) einer die doppelwandige Decke (10) allseitig umgebenden Hülle (50) aus einem luftdurchlässigen und luftverteilenden Gewebe und
25 d) einer mit dem Innenraum (13) der Decke (10) über einen mit dem Luftzuführungsstutzen (30) verbundenen Luftzuführungsschlauch (71) verbundenen Warm- oder Kaltlufterzeugungs- und Zuführungsvorrichtung (70)
30 aus einem mit einem Standgestell (74) und/oder einer Aufhängung (81) versehenen Gehäuse (72), in dessen Innenraum ein Saug-Druck-Gebläse (75), eine im Bereich der Luftaustrittsöffnung (73) des Gehäuses (72) liegende Heizeinrichtung (76) und mindestens
35 ein Reinigungs- und/oder LuftbefeuchtungsfILTER (77, 78) und/oder ein Sauerstoff- bzw. Mischgaszuführungsstutzen (79) und/oder ein Kühlaggregat (80) im Bereich der Luftansaugöffnung (73a) angeordnet sind,

besteht.

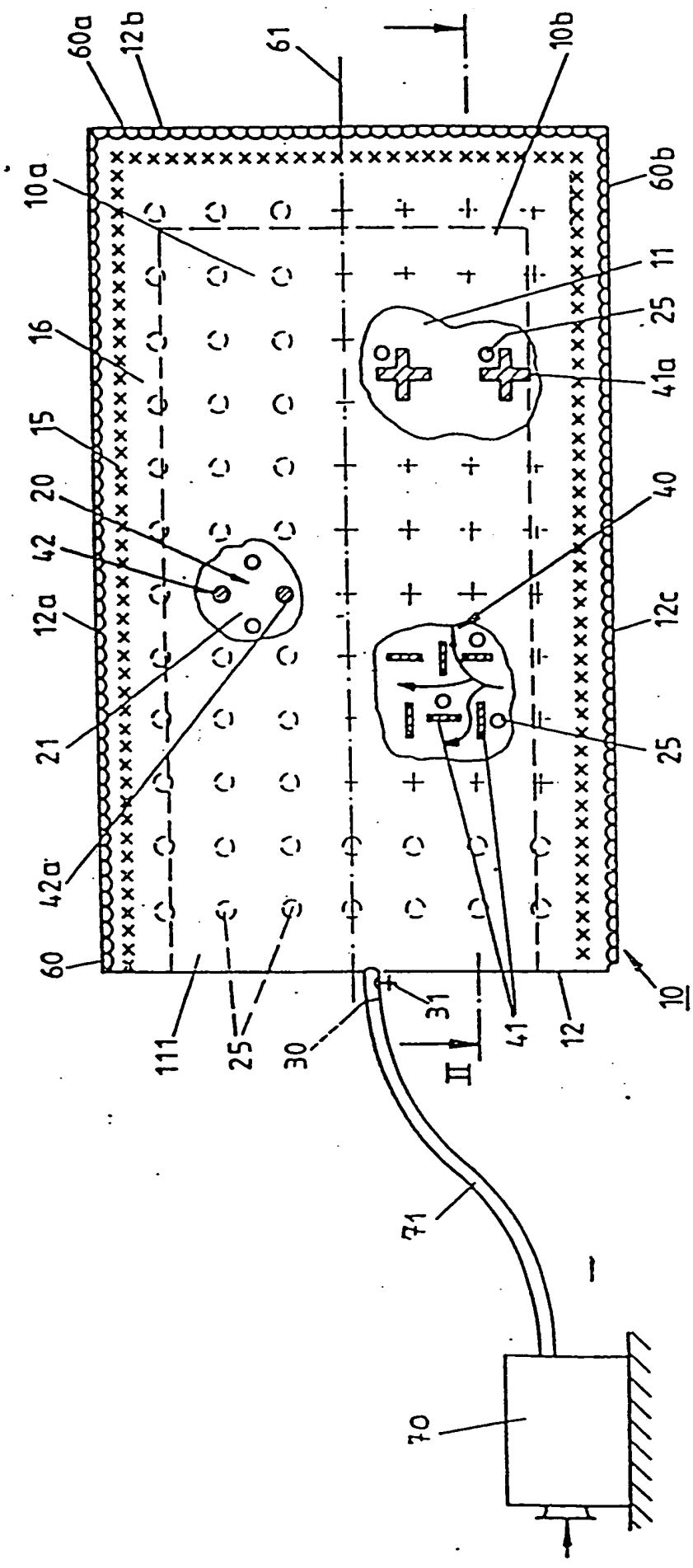
3. Einrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet,
daß benachbart zum umlaufenden Rand (12) bzw. der Randver-
schweißung oder -verklebung (15) der beiden Lagen (11,111)
der Decke (10) ein luftaustrittsöffnungsfreier Abschnitt
5 (16) ausgebildet ist.
4. Einrichtung nach Anspruch 1 bis 3 dadurch gekenn-
zeichnet, daß die Luftaustrittsöffnungen (25) in der
Decke (10) beliebig verteilt, z.B. zu dem Deckenrandbe-
reich (12;12a,12b,12c) zunehmend angeordnet sind.
- 10 5. Einrichtung nach Anspruch 1 bis 4 , dadurch gekenn-
zeichnet, daß die Decke (10) großflächig oder in Kissen-
form ausgebildet ist.
6. Einrichtung nach Anspruch 1 bis 5, dadurch gekennzeichnet,
daß der Warm- oder Kaltluftzuführungsstutzen (30)
15 mit einem Sicherheitsventil (31) versehen ist.
7. Einrichtung nach Anspruch 1 bis 6, dadurch gekennzeichnet,
daß zur Ausbildung der luftkanalartigen Abschnitte
(21) in dem Innenraum (13) der Decke (10) die die beiden
Lagen (11,111) miteinander verbindenden Schweiß- oder Kleb-
20 abschnitte (40) steg- (41a) oder scheibenartig (42a) ausgebildet sind,
in denen die Luftdurchtrittsdurchbrechungen (125) angeordnet sind.
8. Einrichtung nach Anspruch 1 bis 7, dadurch gekenn-
zeichnet, daß die Luftaustrittsöffnungen (25) in der
Lage (11) oder Lagen (11,111) der Decke (10) benachbart
25 bzw. im Bereich der Schweiß- oder Klebabschnitte (40)
vorgesehen sind.
9. Einrichtung nach Anspruch 1 bis 8, dadurch gekenn-
zeichnet, daß die Decke (10) in einer Hülle (50)
aus einem luftdurchlässigen und luftverteilenden Gewebe
30 angeordnet ist.

- 10 10. Einrichtung nach Anspruch 1 bis 9, dadurch gekennzeichnet, daß die Decke (10) an mindestens drei aneinander grenzenden Rändern mit Reißverschlüssen (60, 60a, 60b) oder anderen geeigneten Verbindungsmitteln versehen
5 ist und nach der Faltung um ihre Mittellängsachse (61) und nach Aufeinanderklappen der beiden Deckenhälften (10a, 10b) diese mittels der Reißverschlüsse oder mehreren geeigneten Verbindungsmitteln, wie Klettenverschlüsse od. dgl. (60, 60a, 60b) zusammengehalten sind.
- 10 11. Einrichtung nach Anspruch 1 bis 10, dadurch gekennzeichnet, daß der ReinigungsfILTER (77) und der LuftbefeuchtungsfILTER (78) als in das Gehäuse (72) einschiebbare Austausch-Kassetten ausgebildet sind.
- 15 12. Einrichtung nach Anspruch 1 bis 11, dadurch gekennzeichnet, daß der LuftbefeuchtungsfILTER (78) der Heizeinrichtung (76) nachgeschaltet ist.
- 13 13. Einrichtung nach Anspruch 1 bis 12, dadurch gekennzeichnet, daß das Kühlaggregat (80) dem Gebläse (75) vorgeschaltet ist.
- 20 14. Einrichtung nach Anspruch 1 bis 13, dadurch gekennzeichnet, daß das Gehäuse (72) der Warmlufterzeugungseinrichtung (70) im Bereich des Luftaustrittsstützens (73) mehrere Anschlußstutzen aufweist.
- 25 15. Decke für eine Einrichtung zum Erwärmen oder Kühlen von liegenden oder sitzenden Personen nach den Ansprüchen 1 bis 14, dadurch gekennzeichnet, daß die Decke (10) doppelwandig ausgebildet ist und aus zwei im Randbereich (12; 12a, 12b, 12c) durch Schweiß- oder Klebverbindungen (15) unter Ausbildung eines geschlossenen Innenraumes (13) zusammengehaltenen Lagen (11, 111) aus
30 schweißbarer Kunststoffolie oder einem mit einer Kunststoffolie kaschierten Gewebe besteht, die unter Aus-

5 bildung eines Warm- oder Kaltluft führenden Kanalsystems
 (20) aus einer Vielzahl von miteinander verbundenen
 luftkanalartigen Abschnitten (21) in dem Deckeninnenraum
 (13) abschnittsweise (41) bzw. punktartig (42) über
 10 Schweiß- oder Klebabschnitte miteinander verbunden
 sind, wobei eine (11) oder beide Lagen (11,111) mit
 Luftaustrittsöffnungen (25) versehen und der Deckeninnen-
 raum (13) mit einem im Randbereich der Decke (10) oder
 an einer der beiden Lagen (11,111) befestigten Warm-
 oder Kaltluftzuführungsstutzen (30) verbunden
 ist.

15 16. Einrichtung nach Anspruch 1 bis 15, dadurch gekennzeich-
 net, daß die Warmluft- und Kaltlufterzeugungseinrichtung
 (70) aus einem die Warmlufterzeugungseinrichtung aufneh-
 menden Bauteil und aus einem die Kaltlufterzeugungsein-
 richtung aufnehmenden Bauteil besteht und daß beide Bau-
 teile baukastenartig mittels Verbindungseinrichtungen
 miteinander verbindbar sind.

FIG.1



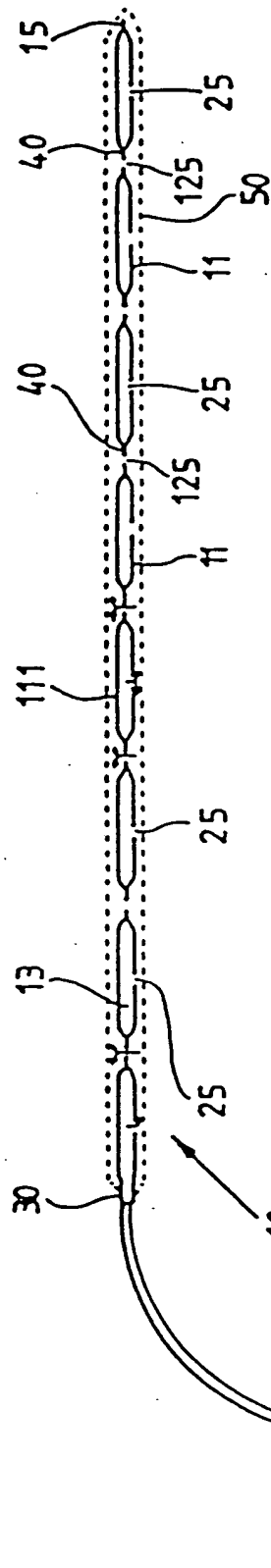
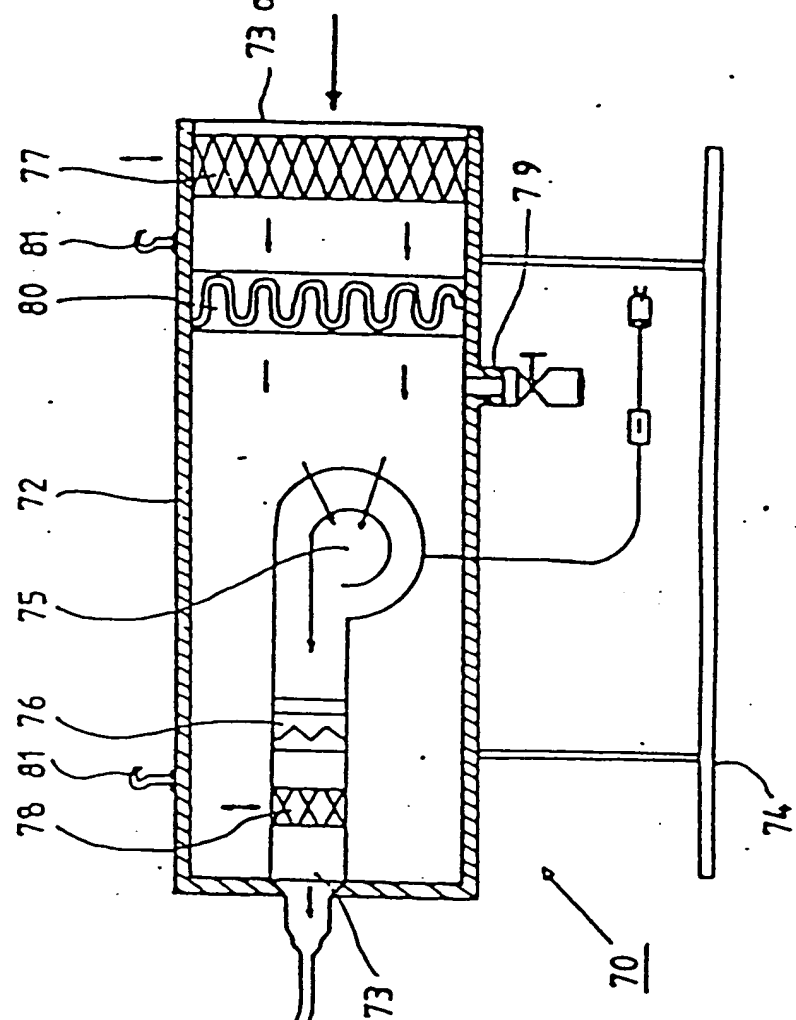


FIG. 2



Gebläse 75
Luftver-
ventilator

European Patent Application 0 113 420 A1

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Device to warm up or cool down individuals in horizontal or sitting position.

The invention refers to a cover for individuals to be supplied either with warm air or with cold air. To ensure an even air flow the cover (10) which is connected to a device generating warm air or cold air (70) is equipped with a number of air exit openings (25), while the interior of the cover (10) consisting of two layers (11, 111) whose borders are welded together, is provided with a multiple of inter-connected air duct-like sectors (21) by means of welded or glued sections to guide the air to the air exit openings (25) (Fig. 2).

Device to warm up or cool down individuals in horizontal or sitting position.

The invention refers to a device to warm up or cool down individuals in horizontal or sitting position.

To protect a human body from getting chilled the use of covers that can be electrically heated in the form of blankets or bedspreads is known. They, however, have the disadvantage that dry heat is generated which often may lead to increased perspiration and has disadvantageous effects, for instance for a patient in a hospital or clinic bed insofar as the heat is perceived as unpleasant despite the heat supply. In addition, such covers, which can be electrically heated, present a safety problem, even when these covers are equipped with overheating thermostats and switches designed to interrupt further power supply when a certain temperature is reached. In addition, these covers which are designed to be heated and to supply heat are technically not designed to also supply cool air if this should be required.

The invention completes the assignment to design a device comprising a covering in the form of a cover for individuals in horizontal or sitting position and a warm air and/or cold air generating device with which the cover, and consequently the individual, is not supplied with dry warm air, but with normal air that has been warmed. The device is also suitable to supply cold air if this is required to cool the respective individual so that the covering, with respective design, may also be used for treatment purposes. In addition, an even air flow over the individual should be achieved and excess pressure in the space between the cover and the individual's body should be prevented.

To complete the assignment a device is proposed in accordance with the invention to warm up or cool down individuals in horizontal or sitting position, comprising

- a) a double-walled cover of two layers welded or glued together in the border area and creating a closed interior space, the layers consisting of weldable plastic foil or of a fabric lined with plastic foil, and creating a channel system containing warm or cold air, and consisting of a multiple of inter-connected air duct-like sections in the cover interior, with the layers connected sectional or punctual with welded or glued sections. One or both layers are equipped with air exit openings, and the cover interior is equipped with an air supply connection piece attached to the border area of the cover or to one of the two layers,
- b) a multiple of air flow openings in the welded and glued sections, and
- c) a device to generate warm or cold air and to supply air, connected with the cover interior via an air supply tube which is connected with the air supply connection piece, consisting of a housing, equipped with a shelf and / or with a suspension device, whose inside comprises a suction-pressure blower, a heating device in the area where the air exit opening of the housing is located, and at least one cleaning and / or air humidifying filter and / or an oxygen or mixed gas supply connection piece and / or one cooling unit in the area where the air intake

opening is located.

In addition, the invention provides for a device to warm up or cool down individuals in horizontal or sitting position, comprising

- a) a double-walled cover of two layers welded or glued together in the border area and creating a closed interior space, the layers consisting of weldable plastic foil or of a fabric lined with plastic foil, and creating a channel system containing warm or cold air, and consisting of a multiple of inter-connected air duct-like sections in the cover interior, with the layers connected sectional or punctual with welded or glued sections. One or both layers are equipped with air exit openings, and the cover interior is equipped with an air supply connection piece attached to the border area of the cover or to one of the two layers,
- b) a multiple of air penetration openings in the welded and glued sections,
- c) a shell encompassing the double-walled cover on all sides and consisting of an air-tight and air diffusing fabric, and
- d) a device to generate warm or cold air and to supply air, connected with the cover interior via an air supply tube which is connected with the air supply connection piece, consisting of a housing, equipped with a shelf and / or with a suspension device, whose inside comprises a suction-pressure blower, a heating device in the area where the air exit opening of the housing is located, and at least one cleaning and / or air humidifying filter and / or an oxygen or mixed gas supply connection piece and / or one cooling unit in the area where the air intake opening is located.

With a device designed as described above it is possible to supply the individual using the cover of this device selectively either with warm air or with cold air with the blower connected to the cover and a heating device. This does not generate dry warm air on the body as with the known covers which can be electrically heated. Instead, it generates warm air with a certain degree of air humidity whose level adjusts to the humidity in the ambient air which supplies the air to generate warm air. It is also possible to increase the humidity in the air which is supplied. If the heating device in the warm air generating device is not in operation, cold air is supplied into the cover via the blower. If the warm air generating device is equipped with several connection pieces, then several covers may be supplied by one single warm air generating device with warm air or with cold air when the heating device is turned off. With a shell encompassing the cover and consisting of a suitable fabric a perfect air penetration through the fabric is guaranteed with simultaneous uniform air distribution. The air exiting from the cover is distributed evenly on both sides of the cover in the spaces between the cover and the shell.

The range of applications for a device designed as described above extends to the most varied possibilities. In addition to using the heating blanket in households the

device can also be used in hospital and clinics, where patients often require a special heat supply because hospital rooms are not excessively heated, and particularly older patients have a pronounced need for heat.

In addition, it is also possible to supply the patient with cold air if required, which is particularly advantageous on very warm days as cooling often contributes to an improvement in the general well-being, and in addition, in certain cases, such as burn injuries, it provides relief. If the cover is used in respective shapes, for instance as a shell or as a small pillow, and if the cover is then supplied with cool air, the cover may support the healing process and may be used for localized treatment on the body, for instance in the shape of a shell wrapped around a patient's feet instead of a leg pack or as a small pillow on the chest in the heart area to relieve cardiac discomfort.

Furthermore, the device may be used in warm regions with a tropical climate to cool down individuals and to replace an expensive air conditioning system with high operational costs. The device can be used with a warm air supply for individuals whose body temperature is too low.

Advantageous further developments of the invention are described in the sub-claims.

The object of the invention is described in more details below with reference to the drawings. The following are shown:

Fig. 1 is a top view of a device comprising a cover and a warm air generating device,

Fig. 2 a vertical cut along line II-II in Fig. 1, and

Fig. 3 a graphical side representation of a cover converted into a sleeping bag or shell.

The device shown in Fig. 1 and 2 consists of a cover 10 and a warm air generating device 70.

The cover 10 is designed double-walled and consists of two layers 11, 111 of preferably rectangular pieces made of weldable plastic foil or of a fabric lined with plastic foil. The two layers 11, 111 are welded or glued together in the area where their continuous borders 12 are located. The welding or glue connecting the borders is indicated at 15 (Fig. 1).

The cover 10 can also consist of one single rectangular piece, which is folded central and diagonal with respect to its longitudinal direction, so that the two halves are superposed, thereby forming the two layers 11, 111 which are then connected together at one cover end by the folding line while the three remaining borders 12a, 12b, 12c are welded or glued together.

The two layers 11, 111 whose borders are welded or glued together encompass an interior space 13 and are connected sectional, as indicated in Fig. 1 at 41, or punctual, as shown at 42 via welded or glued sections 40, while creating a channel system 20, containing warm or cold air, consisting of a multiple of inter-connected air duct-like sections 21 in the interior. The punctual welding joints may be designed as disk-like welding sections 42a. However, other types of welding sections, as indicated at 41a, may also be used to connect the two layers 11, 111 and to form the channel system 20 which contains the warm or cold air. These welding sections 40 are arranged offset from each other so that the air, which is supplied through the interior space 13 of the cover 10, may flow through the entire interior space 13 of the cover 10. It is also advantageous to arrange for the connectors to be offset from each other.

The supply of warm or cold air into the interior space 13 of the cover 10 takes place via an air supply connection piece 30, which is connected with the warm air generating device 70 by means of a flexible tube 71.

In order to supply the individual covered by the cover 10 with the warm or cold air supplied into the interior space 13 of the cover 10, the layer 11 or both layers 11, 111 are provided with air exit openings 25 in the area where the air duct-like sections 21 are located, which are spread over the entire surface of the layer 11 and / or the two layers 11, 111. In order not to impede the air exiting through the air exit openings 25 in any way, the air exit openings 25 are provided adjacent to each other or in the area where the welded or glued sections 40, respectively, are located (Fig. 1).

As shown in Fig. 2 the welded sections 40 are provided with openings 125 through which the air exiting from the openings 25 is distributed evenly over the surface of the cover 10. This is particularly advantageous when the cover 10 is equipped with air exit openings 25 only in its layer 11 and is encompassed by a shell. The air exiting from the openings 25 flows through the openings 125 to the upper surface of the cover 10 and distributes evenly between the cover 10 and the upper shell section so that a good heating or cooling effect is achieved. In addition, the openings 125 contribute to prevent a negative pressure between the cover 10 and the body of the individual using the cover.

In addition, a safety valve 31 can be provided in the warm or cold air supply connection piece 30 or in the connecting tube 70, respectively, in order to prevent excess pressure from building up in the interior space 13 of the cover 10.

The warm or cold air connection piece 30 is connected to one of the two layers 11 or 111 or in the border 12 range of the cover 10, as shown in Fig. 1 and 2.

In order to achieve an even distribution of the air volume in the cover interior space 13, a sector without air exit openings 16 is provided adjacent to the continuous border 12 of

the layer 11 and / or layers 11, 111 which are equipped with air exit openings 25. The inflowing air may flow unimpeded through the sector without air exit openings 16. From there it flows into the range of the air exit openings 25 through which the air may then escape. Preferably, the two layers 11, 111 in the range of the sector without air exit openings 16 are not connected via welded or glued sectors 40 so that the air may flow unimpeded through this sector 16.

The cover 10 can also be used with an outer cover, such as a shell 50 (Fig. 2).

This shell 50 consists of an air-tight fabric so that the air exiting through the air exit openings 25 may reach the body of the individual using the cover. Even commercially available covers or pillow cases are suitable.

In order to also use the cover 10 as a sleeping bag or as a wrap the cover 10 is provided with one or several zippers, Velcro fasteners or similar 60, 60a, 60b. The zippers extend over two or three adjacent border areas of the cover 10, so that an opening remains to slip in or two openings, respectively.

In order to convert the cover 10 into a sleeping bag 100 according to Fig. 3 the cover 10 is folded about its longitudinal center line 61 such that the two cover halves 10a, 10b are superposed. Then, the open long side and the bottom range are closed with zippers or other suitable fastening devices. This makes it possible to create shells to encompass limbs, such as arms and legs.

In accordance with Fig. 2 the warm air generating device 70 consists of a housing 72 equipped with a shelf 74 or a suspension device 81 and with an air intake opening 72a and with an air exit connection piece 73 with which the connecting tube 71 of the cover 10 is connected. In the interior of the housing 72 a blower 75 is provided such that it sucks in air through the housing opening 72a which is then pushed into the interior 13 of the cover 10 via the connecting tube 71.

In addition, in the interior of the housing 72 of the warm air generating device 70 and in the area where the air exit opening 72a is located, a heating device is provided in the form of a heating spiral or similar, which warms or heats, respectively, the air that is sucked in. The heating device 76 tops an air humidifying filter 78 which humidifies the air flowing through if this is required. One or several additional filters 77 may be provided in the housing 72 as air cleaning filters. All filters 77, 78 are designed as replaceable slide-in cassettes in order to simplify the replacement of filters. The housing 72 is also provided with a connection piece 79 in order to add oxygen or other gas-like mediums to the blower air.

The speed of the blower, the fan or the ventilator 75 and also the heating device 76 is adjustable continuously. If the heating device 76 is not turned on the blower sucks in

cold air, i.e. air at the temperature of the ambient air, which is supplied to the cover 10. With the installation of a cooling unit the temperature may even be further decreased.

Both the warm air generating device and the cold air generating device may be provided in separate components which may be connected as a modular system with commonly known fastening devices so that either warm air or cold air may be generated selectively with one device. Housing the warm air generating device and the cold air generating device in separate components has the advantage that one or the other component may be used individually.

Patent Claims

Device to warm up or cool down individuals in horizontal or sitting position, characterized in that the device comprises

- a) a double-walled cover (10) of two layers (11, 111) welded or glued together (15) in the border area (12, 12a, 12b, 12c) and creating a closed interior space (13), the layers (11, 111) consisting of weldable plastic foil or of a fabric lined with plastic foil, and creating a channel system (20), which contains warm or cold air, and consisting of a multiple of inter-connected air duct-like sections (21) in the cover interior (13), with the layers (11, 111) being connected sectional (41) or punctual (42) with welded or glued sections (40), with one (11) or both layers (11, 111) equipped with air exit openings (25), and the cover interior (13) equipped with an air supply connection piece (30) attached to the border area of the cover (10) or to one of the two layers (11, 111),
- b) a multiple of air penetration openings (125) in the welded and glued sections (40), and
- c) a device to generate warm or cold air and to supply air (70), connected with the interior (13) of the cover (10) via an air supply tube (71) which is connected with the air supply connection piece (30), and consisting of a housing (72), equipped with a shelf (74) and / or with a suspension device (81), whose inside comprises a suction-pressure blower (75), a heating device (76) in the area where the air exit opening (73) of the housing (72) is located, and at least one cleaning and / or air humidifying filter (77, 78) and / or an oxygen or mixed gas supply connection piece (79) and / or one cooling unit (80) in the area where the air intake opening (73a) is located.

2. Device to warm up or cool down individuals in horizontal or sitting position, characterized in that the device comprises

- a) a double-walled cover (10) of two layers (11, 111) welded or glued together (15) in the border area (12, 12a, 12b, 12c) and creating a closed interior space (13), the layers (11, 111) consisting of weldable plastic foil or of a fabric lined with plastic foil, and creating a channel system (20), which contains warm or cold air, and consisting of a multiple of inter-connected air duct-like sections (21) in the cover interior (13), with the layers (11, 111) being connected sectional (41) or punctual (42) with welded or glued sections (40), with one (11) or both layers (11, 111) equipped with air exit openings (25), and the cover interior (13) equipped with an air supply connection piece (30) attached to the border area of the cover (10) or to one of the two layers (11, 111),
- b) a multiple of air penetration openings (125) in the welded and glued sections (40),
- c) a shell (50) encompassing the double-walled cover (10) completely on all sides

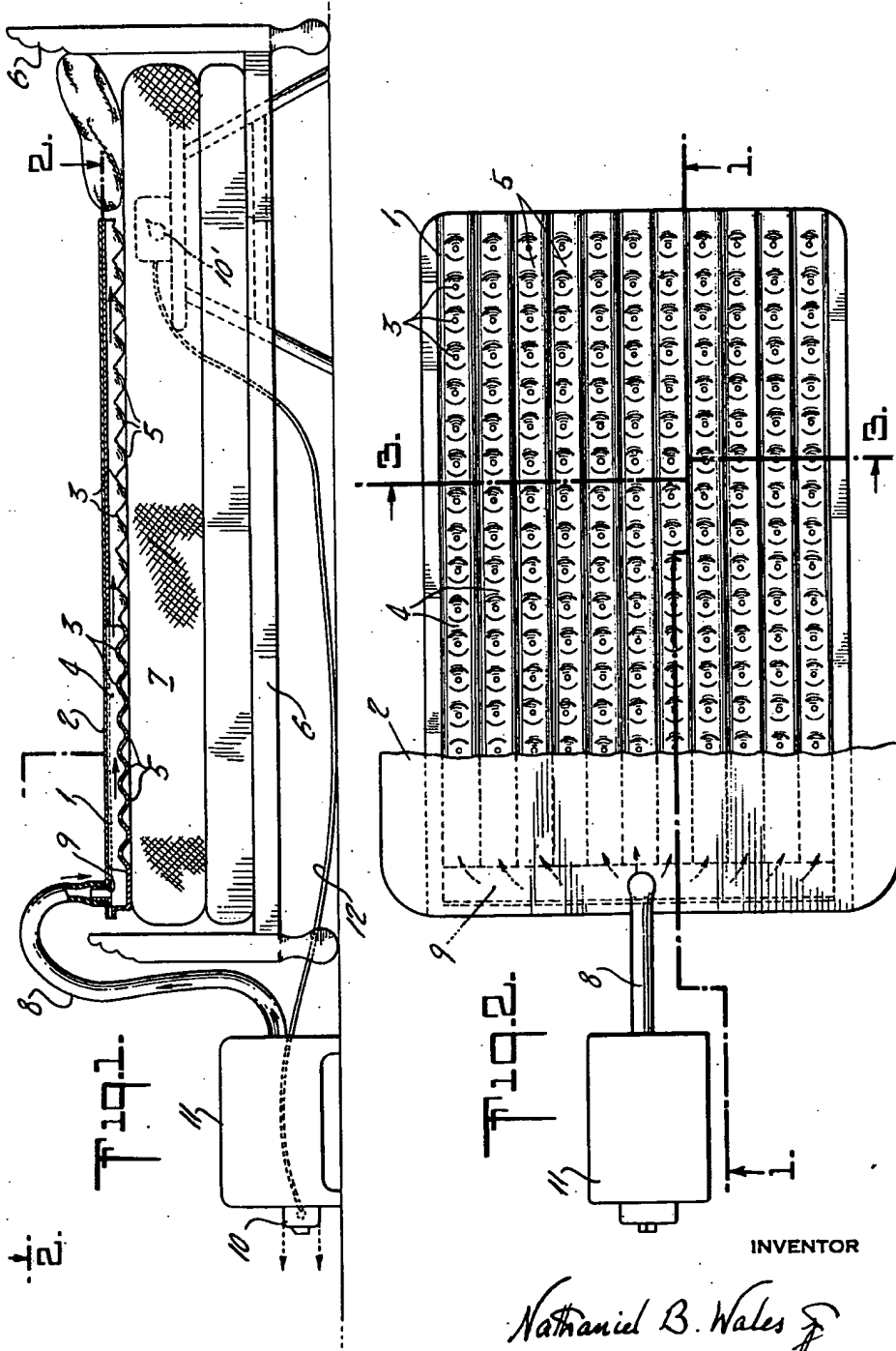
- and made of an air-tight and air diffusing fabric, and
- d) a device to generate warm or cold air and to supply air (70), connected with the interior (13) of the cover (10) via an air supply tube (71) which is connected with the air supply connection piece (30), and consisting of a housing (72), equipped with a shelf (74) and / or with a suspension device (81), whose inside comprises a suction-pressure blower (75), a heating device (76) in the area where the air exit opening (73) of the housing (72) is located, and at least one cleaning and / or air humidifying filter (77, 78) and / or an oxygen or mixed gas supply connection piece (79) and / or one cooling unit (80) in the area where the air intake opening (73a) is located.
3. Device according to claims 1 and 2, characterized in that adjacent to the continuous border (12) or the welded or glued border (15) of the two layers (11, 111) on the cover (10) a sector without air exit openings (16) is provided.
 4. Device according to claims 1 through 3, characterized in that the air exit openings (25) are provided anywhere on the cover (10), for instance increasing towards the cover border area (12, 12a, 12b, 12c).
 5. Device according to claims 1 through 4, characterized in that the cover (10) is designed as a large surface or as a pillow.
 6. Device according to claims 1 through 5, characterized in that the warm or cold air supply connection piece (30) is provided with a safety valve (31).
 7. Device according to claims 1 through 6, characterized in that to form air duct-like sectors (21) in the interior space (13) of the cover (10), the welded or glued sectors (40) connecting the two layers (11, 111) are designed as bridges (41a) or as disks (42a) provided with air flow openings (125).
 8. Device according to claims 1 through 7, characterized in that the air exit openings (25) in the layer (11) or layers (111) of the cover (10) are arranged adjacent or in the range where the welded or glued sections (40), respectively, are located.
 9. Device according to claims 1 through 8, characterized in that the cover (10) is arranged in a shell (50) made of an air-tight and air diffusing fabric.
 10. Device according to claims 1 through 9, characterized in that at least three adjacent borders of the cover (10) are provided with zippers (60, 60a, 60b) or other suitable fastening devices and subsequent to folding it about its center longitudinal axis (61) and subsequent to folding the two cover halves (10a, 10b), they are held together by means of these zippers or several suitable fastening

devices, such as Velcro fasteners or similar (60, 60a, 60b).

11. Device according to claims 1 through 10, characterized in that the cleaning filter (77) and the air humidifying filter (78) are designed as replacement cassettes which may be slid into the housing (72).
12. Device according to claims 1 through 11, characterized in that the air humidifying filter (78) is topped by the heating device (76).
13. Device according to claims 1 through 12, characterized in that the cooling unit (80) is preceding the blower (75).
14. Device according to claims 1 through 13, characterized in that the housing (72) of the warm air generating device (70) is equipped with several connection pieces in the area where the air exit connection piece (73) is located.
15. Cover for a device to warm up or cool down individuals in a horizontal or a sitting position according to the claims 1 through 14, characterized in that the cover (10) is designed double-walled and comprises two layers (11, 111) welded or glued together (15) in the border area (12, 12a, 12b, 12c) and creating a closed interior space (13), the layers (11, 111) consisting of weldable plastic foil or of a fabric lined with plastic foil, and creating a channel system (20), containing warm or cold air, and consisting of a multiple of inter-connected air duct-like sections (21) in the cover interior (13), with the layers (11, 111) being connected sectional (41) or punctual (42) with welded or glued sections (40), with one (11) or both layers (11, 111) equipped with air exit openings (25), and the cover interior (13) equipped with an air supply connection piece (30) attached to the border area of the cover (10) or to one of the two layers (11, 111).
16. Device according to claims 1 through 15, characterized in that the warm air and cold air generating device (70) consists of one component housing the warm air generating device and of one component housing the cold air generating device and that both components can be connected as a modular system via connecting devices.

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3 Sheets-Sheet 1



June 17, 1952

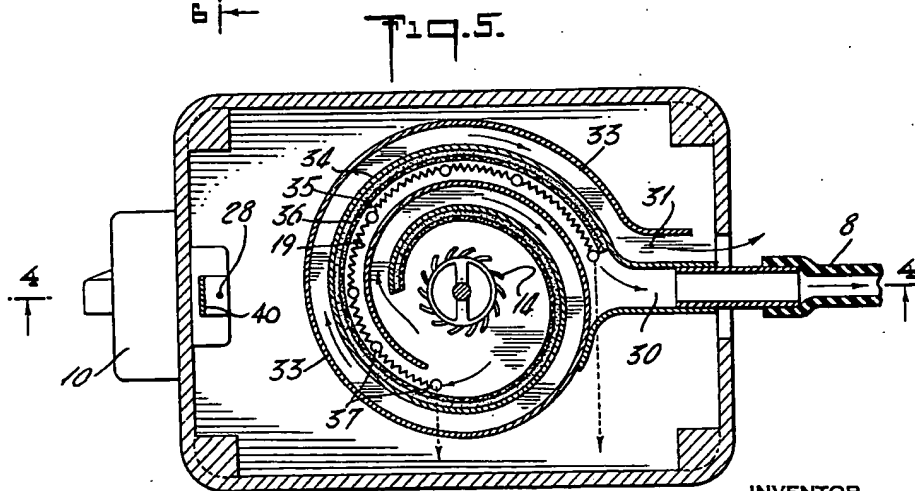
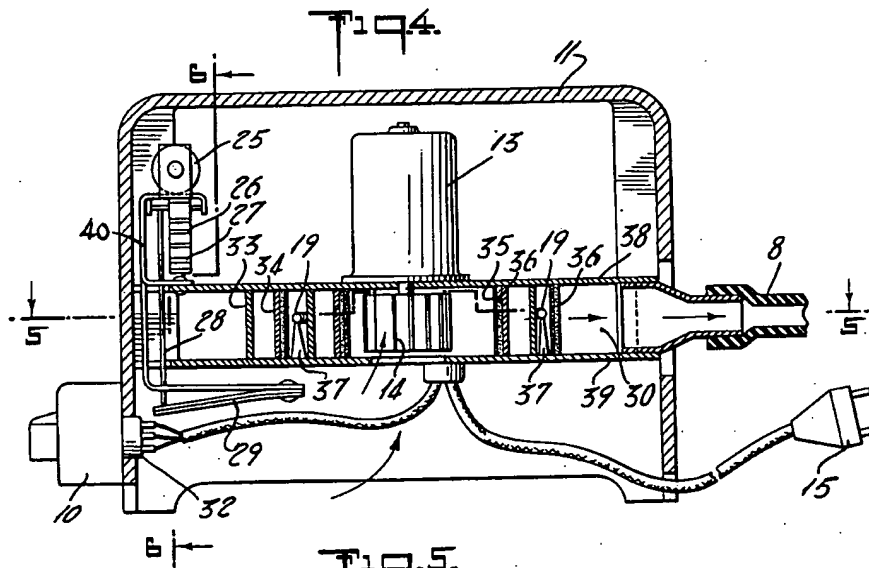
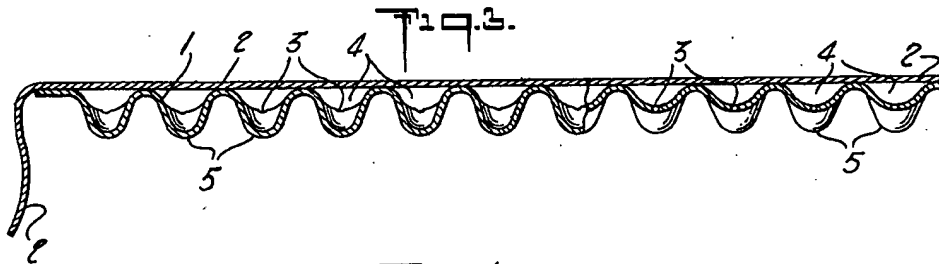
N. B. WALES, JR

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AIR COMFORTER BED COVERING

Filed Aug. 22, 1949

3 Sheets-Sheet 2



INVENTOR

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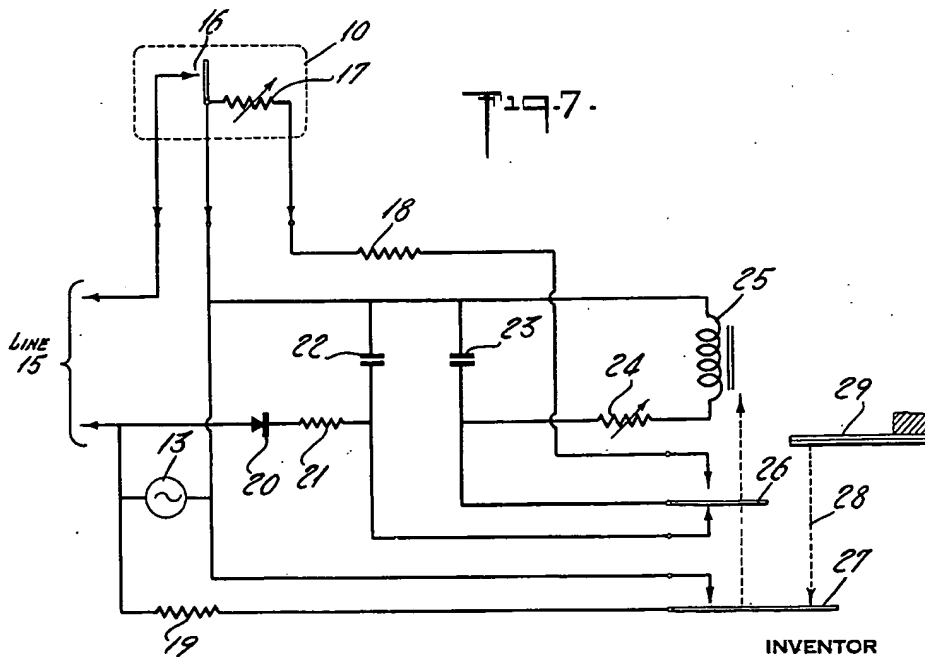
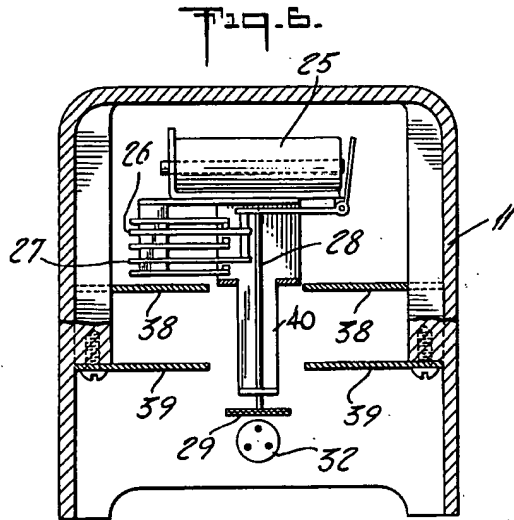
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N. B. WALES, JR
AIR COMFORTER BED COVERING

2,601,189

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3 Sheets-Sheet 3



Nathaniel B. Wales Jr

UNITED STATES PATENT OFFICE

2,601,189

AIR COMFORTER BED COVERING

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6 Claims. (Cl. 4-160)

1

This invention relates to a device for delivering fresh or tempered air to the sleeping human body, and to automatic means for providing and regulating such tempered delivery of air.

By means of a program of research in the prior art of air conditioning beds, and of experimentation with such devices, it has been found that the inflatable type of bed covering or air delivery device, which appears in the prior art, suffers from two practical difficulties which have prevented such devices heretofore from being offered on the market. The first of these objectionable features is that in order to maintain distribution channels by inflation, an appreciable air pressure is necessary. This may be provided either by a highly constricted system of delivery apertures, such as that provided by an infrequently perforated inflatable duct using a moderate volume of air delivery, or by a minimized constriction system, such as that offered by a highly perforate inflatable sheeting requiring a correspondingly large rate of air volume delivery, to maintain inflation pressure. The first case results in the delivery to the body of many high velocity minute jets of air with a consequently unhealthful and uncomfortable localized chilling action, whereas this second case, involving both high pressure and high volume of delivery, necessarily requires an excessive amount of blower power, and in addition introduces difficult noise problems, since this class of device must be virtually noiseless.

The second objectionable characteristic of the inflatable type of covering has been found to be its formation of "hot spots" where it contacts the body due to its natural tendency to conform to the body. At these areas of contact, circulation of the air is inhibited, and the consequent temperature gradients are uncomfortable.

The present invention obviates these difficulties by its concept of the combination in a bed covering, of a flexible self-sustaining non-inflated duct delivery manifold with a grid of closely spaced support points on its underside to provide homogeneous accessibility to the covered body of the delivered air.

Because of the fact that this labyrinth of distribution ducts is self-sustaining, although light and flexible, it requires only a fraction of the air delivery pressure which an inflatable duct would require. This permits the use of a small low powered blower unit to diffuse the tempered air at low pressure uniformly over the body, since the duct structure taught by this invention combines self-sustaining air delivery channels with flexibility, light weight, and a geometry guaranteeing an absence of air-obscured areas on the sleeper.

It has been found that this self-sustaining flexible distribution labyrinth may be formed by subjecting a thin sponge composition sheet, such as

2

of foam rubber or plastic, to pressure under appropriate temperatures in a roll press or molding die. The desired geometry provides longitudinal self-sustaining air channels with a grid of supporting fingers or bumps directed downward so as to prevent any appreciable area of the body on which it may bear, either directly or through an intervening sheet, from being made inaccessible of the air delivery to the covering.

In a preferred form of this flexible air delivery manifold, the formed sponge rubber or plastic covering above described is perforated at intervals along the air delivery channels in such a way as to insure uniform air delivery over the area of the covering, and a thin flexible air-impervious sheet is secured to the top of the corrugated sponge composition air channels to comprise self-sustaining air ducts. Thus, in this preferred form of dry air comforter, the upper wall of the ducts is formed by the air impervious sheet, while the lower walls of the ducts are formed by the molded sponge composition under-covering. This composite manifold may be fabricated in such a way as to be extremely light and flexible.

Evidently, the flexible self-sustaining manifold principle embodying my concept of a grid of support points may be fabricated in a variety of ways and with various materials, such as by an extrusion wholly containing the self-supporting air ducts made of a plastic foam. A second alternative execution of this combination may be effected by joining one imperforate sheet at a grid of points with a perforate sheet by means of multiple closely positioned spacers so as to provide the self-sustaining duct feature in combination with multiple under surface support points.

It is further possible for this purpose to secure a plurality of mutually interconnected individual perforated tubular ducts to a flexible laminar backing sheet to achieve the same end of self-sustaining flexible air delivery ducting having a dispersed support geometry.

The air comforter embodied in this invention is intended to provide sleeping comfort all year round. To attain this, it has been recognized that the principal source of discomfort in hot weather is the humidity, rather than the temperature, since an excessive humidity causes the human body's natural refrigeration mechanism of surface evaporation of its perspiration, to become inoperative due to the opposing vapor pressure of the air. This invention teaches the use of a drying agent, such as silica-gel to partially remove the moisture from the air delivered to this ducted bed covering. Since such drying agents are generally exothermic in action, this invention further discloses a heat interchanging structure which utilizes a portion of the air delivered by the blower to reduce the temperature of the air thus dried

3

and heated to a temperature closer to the ambient room temperature, thereby providing a further natural and healthful source of body refrigeration.

The air delivery unit shown in this invention is provided with air heating means, for winter use, regulated by a novel form of thermostatically responsive control device. In addition, a separable manual control box is disclosed so constructed that after the initial period of personal adjustment has been passed, the control box, together with its registration of personal selection thus established within it, may be disconnected from its cable, and plugged directly into the air delivery unit, thereby obviating further inconvenience due to the presence of this cable.

An object of this invention is to provide a structure of air-distributing bed covering which will not be contingent on air pressure or the sleeper's movement or position to insure uniform diffusion of air over the area of the bed.

A second object is to make possible the healthful comfort of a sleeper in hot weather without the use of chilled air.

A third object is to make possible the manufacture of an automatic year round air comforter bed covering at a minimum of cost, and at a maximum of quiet and comfort.

Other objects are implicit in the following specification and claims.

Referring to the drawings:

Figure 1 is a view in elevation of a bed showing the disposition of the air delivery and tempering unit, the separable manual control box, and a view in section of the preferred form of my self-sustaining air delivery manifold.

Figure 2 is the plan view of Figure 1 showing the bed covering in partial section along the broken line 2—2 of Figure 1.

Figure 3 is the section of 3—3 of Figure 1.

Figure 4 is a section in elevation of the air delivery unit 1—1 of Figure 1.

Figure 5 is the plan section 5—5 of Figure 4.

Figure 6 is the section 6—6 of Figure 4; and Figure 7 is a schematic wiring diagram of the control system of a preferred form of my invention.

The bed covering detailed in Figures 1, 2 and 3 consists of an upper flexible air-impervious sheet 2 which is secured to the periphery and to the longitudinal lines of contact which it makes with the under flexible corrugated and preformed duct member 1. The means of this securance may comprise cementing, riveting, sewing, or, in the case of plastic materials, thermal bonding. The duct member 1 may be made of sponge rubber or of plastic foam. It is provided with a system of perforations 3, and is so formed as to present a grid of support protuberances 5 on its under side. The longitudinal duct passages 4 are formed in the space between the upper impervious sheet 2 and the longitudinal corrugations formed in member 1. It may be seen in Figure 3 that the protuberances 5 depend from the duct passages 4 and that the air delivery holes 3 are located in the less protuberant lower boundaries of the ducts so as to permit free diffusion of the delivered air over the sleeping body covered by this perforate member 1. As essential feature of this construction is its provision of an air delivery manifold which need not be inflated to form its passages. Thus the self-sustaining nature of these passages will not be closed off or strangled by the creasing, folding, and bodily obstructions, such as by the

4

weight of an arm or leg, which is suffered by any ducting system dependent on air pressure inflation.

The longitudinal air delivery ducts 4 are shown in Figures 1 and 2 all to communicate with the common transverse manifold duct 9 at the foot of the bed covering. Distribution duct 9 in turn is connected by the flexible coupling duct 8 through a suitable separable connector. Duct 8 provides the means for delivery of tempered air from the blower unit 11 to the bed covering, shown resting on the bedding 7 of bed 6. In Figure 1 the separable manual control box 10 is shown in full line plugged into the blower unit 11. The broken line outline 10 shows this control box in its alternative bedside position when connected to the blower unit through cable 12. As shown at the left at Figure 3 the upper impervious sheet 2 is provided with sufficient excess area beyond its securance to duct member 1 to form a skirt which hangs over the edge of the bed, or may be tucked in under bedding 7, so as to confine the entrance of air underneath the bed covering to the tempered air delivered at low pressure by the blower unit 11.

The blower and tempering unit shown in Figures 4, 5 and 6, comprises a case 11 sustaining an upper (preferably metal) chassis plate 38 and a lower chassis plate 39. These are spaced apart by and secured to the spiral sheet metal walls 33 and 34 so as to form a main air delivery and drying duct 30, and a heat exchanger duct 31. A blower rotor 14 is positioned at the center of the duct system and is driven by motor 13 secured to upper chassis plate 38. Air enters blower rotor 14 axially through the circular hole in lower chassis plate 39, and is delivered in major part through spiral duct channel 30, thence entering delivery tube 8 for distribution through the bed covering. A smaller portion of the air is passed through duct 31 where it cools the wall 34 thence passing out into the room via the clearance hole in case 11 surrounding exit duct 8. Channel 30 is provided with a chemical drying agent 35 for absorbing moisture from the air passing through this channel. This agent, such as silica-gel, may be of granular form, and is contained between a close meshed screen 35 and the duct wall 34 so as to present a large exposed area to the air passing through duct 30. In addition, due to the spiral geometry, the centrifugal component of the air's motion tends to assure a thorough contact between the air and drying agent so positioned. As before noted the absorption of moisture is accompanied in most drying agents by an exothermic reaction which would tend to heat the agent 35 and with it the delivered air. However, an appreciable portion of the heat so generated is conducted through the wall 34, which is in intimate thermal contact with the drying agent, and this heat is carried off by the portion of the air blast delivered by the blower through duct 31. This results in an ultimate net refrigerative effect on the person to whom the air is delivered. An electric air heating element 19 is positioned in duct 30 and is supported on stand off insulators 37 secured to the lower plate 39. This heater wire 19 is energized periodically in cold weather at a rate and pulse length of which the integrated power dissipation is made to be a function of the room's ambient temperature as measured by bimetallic thermoresponsive element 29. It is evi-

5

dent that by switch means obvious to the art, heater 19 may be continuously energized for a period during the day so as to regenerate the drying agent 36 by baking out the moisture absorbed during the night. Bimetallic element 29 is mounted on a bracket 40 secured to upper chassis 30, the relay 25 carrying leaf switches 26 and 27 is also mounted on bracket 40. A push rod 28 so connects the end of bimetallic leaf 29 and the armature of relay 25 that the resiliency of leaf 29 and the force generated by thermal stresses therein causes this leaf to act as the bias spring for the armature of relay 25. This thermally variable mechanical bias on relay 25 is utilized to control the effective dissipation of heater 19 as may be seen with reference to Figure 7. In Figure 7 a master control switch 16, located in the separable box 10, applies the line current from terminals 15 to the blower 13 and to the heater element 19 through normally open relay contacts 27. In addition, this line voltage is rectified by dry rectifier 20 and applied through limiting resistor 21 to capacitance 22 thereby making 22 a source of direct current. In the energized position of the relay contacts 26, condenser 23 is placed in parallel with condenser 22. Consequently as the potential in condenser 22 rises at a rate influenced by the limiting resistors 21 and the line voltage, the potential rises in parallel condenser 23. Coincidentally the current through the field of relay 25 will also rise in a measure influenced by its own resistance and that of series resistor 24. When the voltage in condenser 23 has risen sufficiently to cause the relay armature to "drop in," relay switch 26 will disconnect condenser 23 from its current supply and connect it to the series shorting resistors 18 and 17. Consequently, the length of time necessary for the relay current derivative from condenser 23 to fall to the "drop out" value will be influenced by the setting of control 17 located in the manual control box.

However, as before outlined, the mechanical bias on the relay 25 is controlled by the ambient temperature of bimetallic strip 29, and, consequently, the period of pulsation of the relay 25 and hence the integrated power output of heater 19 is dependent on the room temperature. Conversely, the pulse length is controllable manually by resistor 17 and so can also modulate the effective wattage of the air heater 19. Due to the appreciably different values of relay current for "drop in" and "drop out" for a given mechanical bias it has been found that the system may be easily made to operate over a 20 to 1 range of integrated power dissipation. By proper choice of components and adjustment of resistor 24 the system is caused to deliver no current to the heater 19 above any chosen "cross over" temperature. Consequently, with dropping temperature, the mechanical bias supplied by strip 29 diminishes until the relay can begin pulsing, thereby delivering increasing power to the heater as the rate of pulsing increases.

What I desire to protect by United States Letters Patent is encompassed in the following claims:

1. In a bed covering, the combination comprising an air-impervious flexible upper cover member, a flexible perforated lower distribution member secured at its periphery to said upper cover member, means for forming a plurality of self-sustaining air distribution ducts between said upper cover member and said lower per-

6

forated member, said ducts being in communication with the perforations in said lower member, a source of air pressure, and duct means communicating between said source of air pressure and said self-sustaining ducts whereby to diffuse air downwardly through the perforations in said lower distribution member.

2. In a bed covering, the combination comprising an air-impervious flexible upper cover member, a flexible lower distribution member secured to said upper cover member, means to space intermittently said upper cover member from said lower distribution member between the points of said securance whereby to form a manifold of self-sustaining air distribution ducts therebetween, said spacing means forming an array of protuberant support areas in said lower distribution member, a plurality of perforations in said lower distribution member communicating with said self-sustaining ducts, a source of air pressure, and flexible duct means communicating between said source of air pressure and said self-sustaining ducts whereby to diffuse air downwardly from said bed covering through said perforations.

3. In a bed covering, the combination comprising an air-impervious flexible upper cover member, a flexible perforated lower distribution member, a plurality of self-sustaining air distribution ducts interposed between said impervious upper member and said perforated lower member and communicating with the perforations in said lower member, a plurality of protuberant support areas formed in said lower member, a source of air pressure, and flexible duct means communicating between said source of air pressure and said self-sustaining distribution ducts whereby to diffuse air downwardly from said bed covering through said perforations.

4. In a bed covering according to claim 9, means for heating the air passing through said flexible duct means.

5. In a bed covering according to claim 9, air-drying means for drying the air passing through said flexible duct means.

6. In a device for diffusing air from a bed covering, the combination comprising a flexible self-sustaining air distribution manifold integral with said bed covering, means to diffuse air delivered by said manifold downwardly from said bed covering, an air pump, an exothermic agent for absorbing moisture from said air, heat-exchanger means for lowering the temperature of the air heated by said exothermic agent, a first duct means for conveying a portion of the air displaced by said pump first into contact with said exothermic drying agent and then into said distribution manifold for diffusion through the bed covering, and a second duct means for conveying a remaining portion of the air displaced by said pump into contact with said heat-exchanger means.

NATHANIEL B. WALES, Jr.

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US005125238A

United States Patent [19]

Ragan et al.

[11] **Patent Number:** 5,125,238[45] **Date of Patent:** Jun. 30, 1992**[54] PATIENT WARMING OR COOLING BLANKET****[75] Inventors:** Raymond G. Ragan; James G. Stephenson; Charles L. Zuck, all of Marshall, Mich.**[73] Assignee:** Progressive Dynamics, Inc., Marshall, Mich.**[21] Appl. No.:** 692,572**[22] Filed:** Apr. 29, 1991**[51] Int. Cl.⁵** A47C 27/08**[52] U.S. Cl.** 62/259.3; 165/46; 126/204; 128/400; 5/423**[58] Field of Search** 62/259.3, 261; 128/400; 165/46; 5/284, 423, 469; 126/204**[56] References Cited****U.S. PATENT DOCUMENTS**

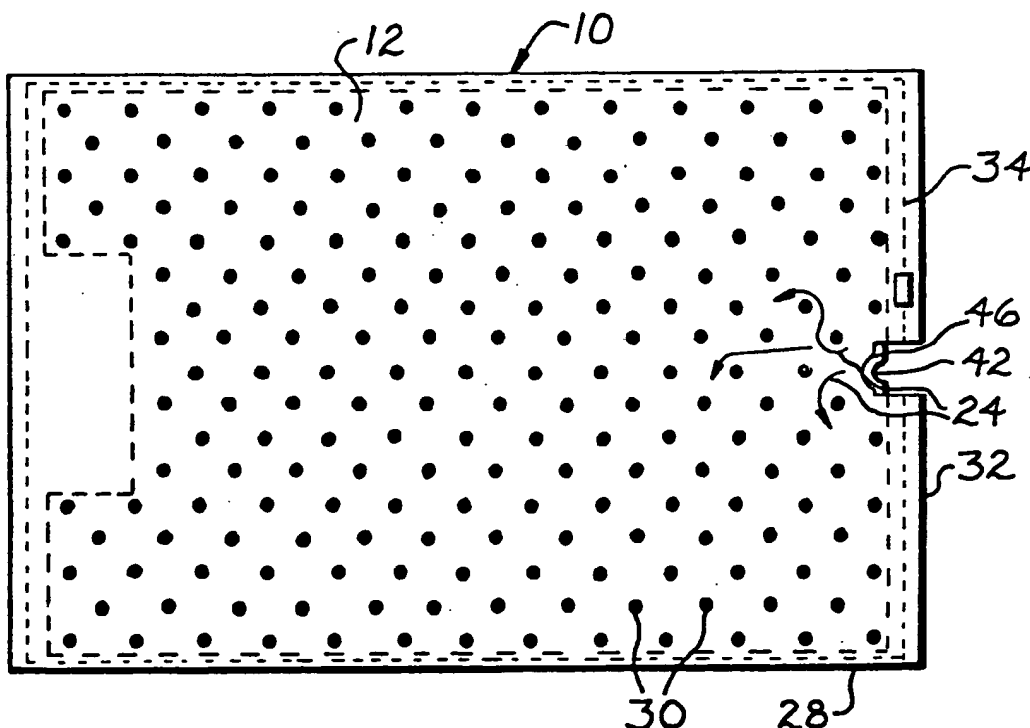
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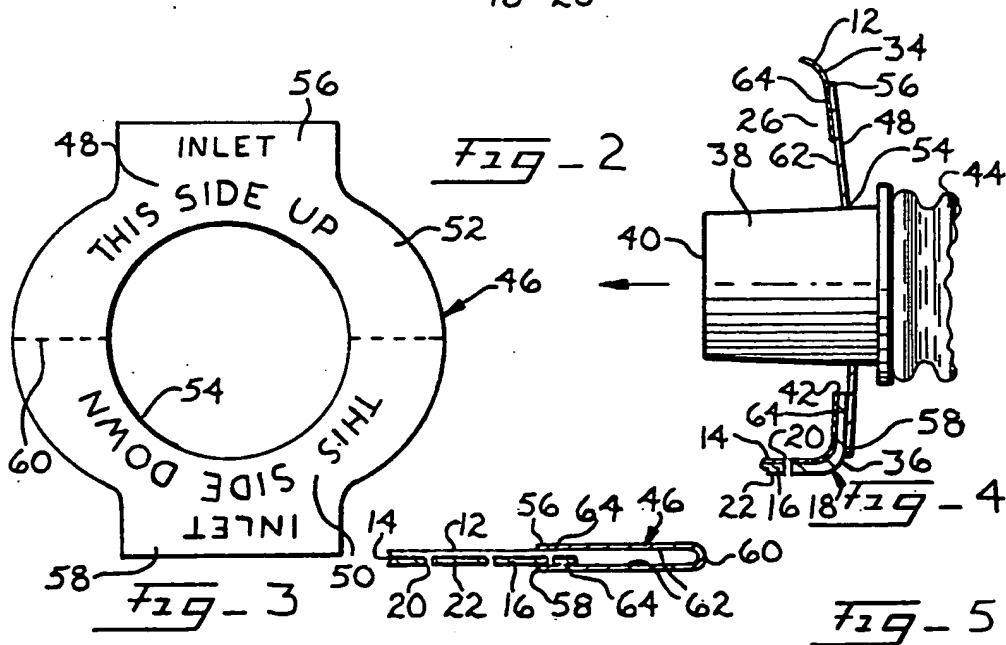
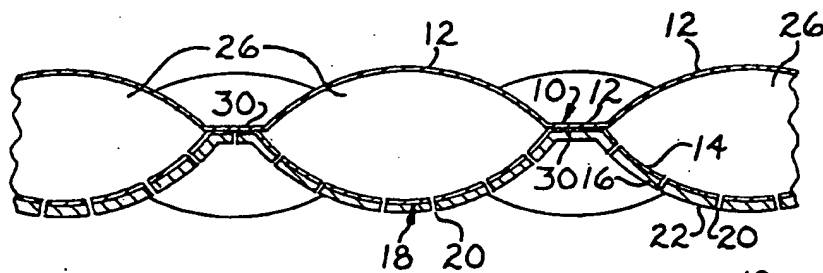
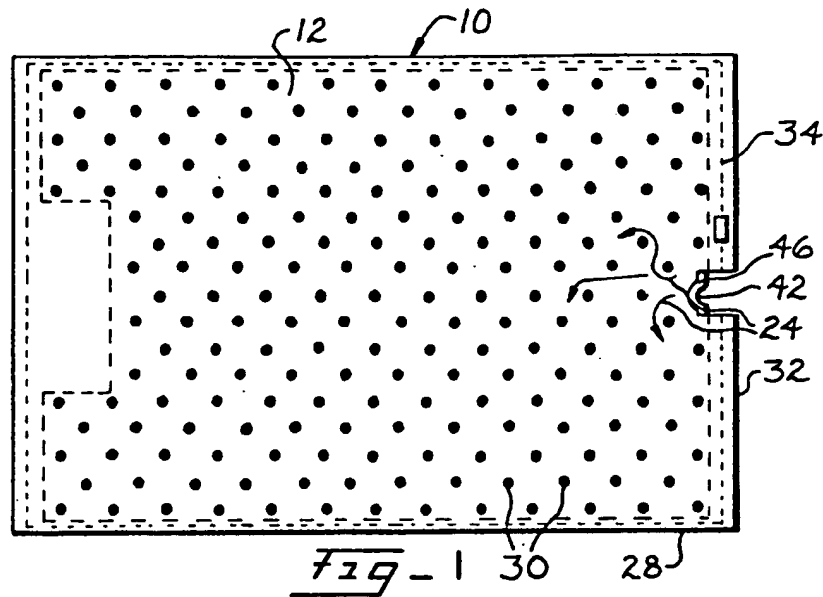
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Assistant Examiner—William C. Doerrler
Attorney, Agent, or Firm—Beaman & Beaman

[57] ABSTRACT

A disposable patient heating or cooling blanket having three layers of flexible sheeting two of which form an air chamber, the third of which is a comfortable layer for contact with the patient and which, having a greater friction characteristic, aids in keeping the blanket in place on the patient. The patient is bathed in conditioned air through a multiplicity of orifices in the bottom layers of the blanket and the size and location of the orifices are such that sufficient pressure exists within the blanket to prevent crimping blockage and to insure a uniform flow of air through the orifices throughout the blanket area. Conditioned air is introduced horizontally through an external nozzle which is inserted into a low cost foldable fitting plate bonded to the blanket which permits the blanket to be concisely folded and packaged.

9 Claims, 1 Drawing Sheet



PATIENT WARMING OR COOLING BLANKET

BACKGROUND OF THE INVENTION

Medical care providers have long recognized the need to provide warmth and cooling directly to patients as part of their treatment and therapy. The relatively recent proliferation of mobile emergency medical facilities as an adjunct to fire departments and the expansion of clinical facility services in the community has increased the number of sites where such treatments must be given. Consequently, there has evolved a need for an inexpensive disposable patient thermal control blanket which will provide a distributed air flow while maintaining sufficient pressure in the blanket to prevent blockage of the flow due to the blanket folding or crimping.

FIELD OF THE INVENTION

The present application relates to a patient warming or cooling blanket which employs a bath of temperature controlled air applied to the patient rather than utilizing direct or indirect contact with a heat exchanger.

DESCRIPTION OF RELATED ART

Devices of the type described above are well known in the art, for example U.S. Pat. No. 2,093,834 discloses of a mechanism for providing localized air conditioning by means of an inflatable covering constructed of plurality of tubular enclosures of porous material in conjunction with a quilted covering. Devices of this construction rely on a recirculating cooling or heating medium and transfer heat mainly through contact with the blanket surfaces. This patented device as well as those of U.S. Pat. Nos. 2,601,189 and 4,572,188 which are also of such essentially tubular or corrugated construction have the disadvantage that they are longitudinally rigid, relatively uncomfortable, have a high profile, and due to the complexity of devices of this type, they are relatively expensive to construct. U.S. Pat. No. 2,093,834 shows a construction which is susceptible to tube wall compression which constricts the flow path and increases internal pressure resulting in flow restriction and rigidity due to the entrapment of air within the device. The construction of the devices of U.S. Pat. Nos. 2,601,189 and 4,572,188 include lateral passages to adjacent tubes which do not fully alleviate the tube compression flow restriction problem and are more expensive to fabricate than the instant invention by virtue of their complex construction.

OBJECTS OF THE INVENTION

In view of the foregoing shortcomings in pneumatic temperature control patient blanket fabrication, it is an object of the invention to provide a disposable blanket for use in patient warming and cooling applications which is simple to operate, easy to construct, economical to manufacture and concisely storable.

A further object of the invention is to provide a pneumatic blanket which employs materials and structural elements which are comfortable to the patient with whom they contact.

An additional object of the pneumatic patient blanket is to provide an even, pleasant and healthy flow of air uniformly over the covered area regardless of where the blanket air chamber may be compressed.

SUMMARY OF THE INVENTION

The invention pertains to disposable heating and cooling patient blankets. An external air conditioning unit provides low pressure heated or dehumidified and cooled air through a flexible hose having a supply nozzle. Conditioned air is introduced into the blanket pneumatic chamber by means of the supply nozzle which inserts into an inlet port through a low-cost folding cardboard fitting plate mounted on the edge of the blanket.

The folding cardboard fitting plate has a folded storage mode to permit the blanket to be folded into a compact mass for storage. In its open operative mode the fitting plate is essentially planar having an opening which is sized to snugly receive the supply nozzle horizontally through the blanket edge directly into a pneumatic flow chamber thereby avoiding opposite wall obstructions of the supply nozzle airflow.

The pneumatic flow chamber is constructed of, and defined by, the interface of two polyethylene sheets heat bonded together at their perimeters and at a plurality of staking points in a single step of the assembly process. Air flow through the blanket is enhanced by the creation of fully redundant flow paths around the staggered dot staking pattern which is distributed throughout the blanket area. A layer of non-woven wood pulp airlaid material is adhesively bonded to the bottom sheet of polypropylene thereby forming a laminated layer and both the bottom sheet of polyethylene and airlaid material are perforated by an array of selectively sized orifices. The orifices are distributed in a regular pattern throughout the area bounded by the pneumatic chamber parameter and allow the emission of an even, gentle air stream from the blanket bottom and are of such size that the blanket will be pressurized enough to hold its shape and resist crimping of the air flow due to normal compressive forces being applied to the blanket. The airlaid material rests comfortably against the patient bathing the patient in the air emitted from the orifices and helps keep the blanket from sliding off the patient because of its high frictional characteristics.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 is a plan view of the patient blanket in accord with the invention,

FIG. 2 is an enlarged, cross-sectional, detail elevation view of the blanket showing the pneumatic chamber between staking points as well as the relationship of the several blanket layers in accord with the invention,

FIG. 3 is an elevational view of the folding cardboard fitting plate in accord with the invention shown in the open or unfolded mode,

FIG. 4 is an enlarged, elevational, detail sectional view of the folding cardboard fitting plate air inlet connection with an external air supply nozzle inserted therein in accord with the invention, and

FIG. 5 is an enlarged, elevational, detail view of the cardboard fitting plate as attached to the blanket in accord with the invention and shown in the folded storage condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the invention, a three layer construction is employed to form the patient blanket 10 with two layers forming an air chamber and a third layer providing a comfortable surface for contact with the patient. It will be obvious to a person familiar in the art, that any of a number of flexible sheeting materials can be used for the upper flexible sheet 12 and lower flexible sheet 14, but in the preferred embodiment for economy, strength and flexibility considerations 1.5 mil thickness polyethylene sheeting was selected. Simple, economical assembly of the blanket begins when the .015 inch thick layer of non-woven fibrous layer of wood pulp airlaid material 16 is adhesively bonded to the lower side of the 1.5 mil thickness lower flexible sheet 14 forming the laminate assembly 18, as shown in FIG. 2. This fibrous layer 16 provides a comfortable surface in contact with the patient and its high frictional characteristic helps keep the blanket in place on the patient. A material of this type is available under the trademark "AIRTEX" from the Fiberware Corporation. The laminate assembly 18 is then perforated with specifically sized orifice holes 20 by means of a punch plate. The orifice size is determined by the volume flow characteristics of the air source and by the following formula:

$$Q = K A \sqrt{\Delta P}$$

Where Q is the air flow rate in cubic feet per minute. K is a constant, A is the area of the orifices and ΔP is the differential pressure in inches of water at standard room conditions. From test results it was determined that for proper flow and inflation K should be 11.718, A should equal 0.001 square inches for each square inch of blanket which will produce 0.035 inch diameter orifices on 1 inch centers and ΔP is 0.25 inches of water.

The sizing of the orifices 20 by this method assures sufficient inflation to minimize crimping of the blanket while providing continuous air flow to the lower surface 22 that is both evenly distributed and above the minimum flow quantity required. The problems associated with compressing or crimping the blanket are also alleviated through the invention's incorporation of a multiplicity of redundant flow paths as shown by the arrows 24 within the pneumatic flow chambers 26 as shown in FIG. 1 due to the inflation of the blanket.

Subsequent to the lower layer lamination and orifice perforation, the upper flexible sheet 12 is laid upon the laminated assembly 18 and the periphery 28 of the two polyethylene layers are heat sealed together. In the same process step, the two flexible sheets are also staked together in a staggered pattern of one inch diameter heat sealed staking bonds or welds 30 throughout the area within the periphery seal. This staking creates the redundant flow paths 24 feature of the invention as well as serving the dual purposes of reducing stresses to the inflated structure through reducing the radius of the chambers 26, and through the same mechanism reducing the blanket inflated thickness while assuring flow distribution and continuity across the lower surface 22 of the blanket.

The preferred air inlet location is through a fitting plate on the blanket edge 32 intermediate the upper flexible sheet first end 34 and the lower flexible sheet first end 36. In this blanket edge center, a semicircular cut is made through the laminated assembly 18 and the upper flexible sheet 12. When the blanket is inflated,

these semicircular cuts form an essentially horizontal circular air inlet port 42. By horizontal insertion of an air supply nozzle through the fitting plate into the blanket air flow is unrestricted by blanket film members pressing against the nozzle opening, and furthermore, there is no need to support the nozzle's weight. The conditioned air is introduced through a flexible hose 44 having a frustoconical end nozzle 38 converging towards the nozzle end 40.

The fitting plate 46, in accord with the invention, is best shown in FIGS. 3, 4 and 5. The plate 46 is fabricated of a low cost, foldable material with an exterior surface suitable for direct labeling. In the preferred embodiment, cardboard was selected as meeting the aforementioned criteria as well as being an inexpensive and easy to print material. The fitting plate 46 is an elongated member having a first end 48 and a second end 50 each with an extension and having a circular central portion 52 intermediate the ends. The circular center portion 52 defines an opening 54 which aligns with the blanket chamber port 42 to snugly receive the frustoconical air supply nozzle 38, thereby introducing conditioned air into the pneumatic flow chambers 26 when the fitting plate 46 is opened to its unfolded planar operative configuration as best seen in FIGS. 3 and 4. This open configuration provides full open area flow into the pneumatic flow chambers 26 through the port 42 and provides for easy nozzle 38 insertion into the blanket 10 edge 32.

As seen in FIG. 3, the fitting plate 46 preferably contains explanatory labeling to assist the user in the proper use of the invention and provides for simultaneous labeling of the blanket upper and bottom surfaces without additional labels. The plate first end extension 56 and second end extension 58 are labeled with the words "INLET" to mark the port 42 location into which the conditioned supply air is introduced. On the circular center portion 52, the plate first end 48 to which the upper sheet 12 is attached is identified by the words "THIS SIDE UP", and the plate second end 50 to which the blanket lower surface 22 is attached is identified by the words "THIS SIDE DOWN". Intermediate the plate first end 48 and second end 50 on the center portion 52 is a fold line 60 identified by dashed lines across the fitting plate central portion 52. This fold line is aligned with the blanket edge 32 when the fitting plate 46 is installed on the blanket 10.

Semicircular cuts are made in the blanket upper sheet and lower sheet first ends 34 as seen in FIG. 1, which define the blanket chamber port 42 at which the fitting plate 46 is mounted as in FIG. 1. The plate 46 is aligned with the upper sheet 12 and the laminated assembly 18 and installed in line with the blanket edge 32 forming a hinge-like relationship with the blanket edge 32 as seen in FIG. 5. Because the adhesive is applied only to the plate center portion 52 inner side 62, forming a bond 64, the end extensions are free of the blanket surfaces. By remaining free, the inflated blanket profile and stress to the adhesive bond 64 during inflation are minimized; and the plate first end extension 56 and the plate second end extension 58 may be grasped and separated during nozzle insertion. As shown in FIG. 5, the fitting plate 46 provides concise packaging because it compactly folds along the plate fold line 60 providing a low profile; this configuration has the further advantage of reducing the stress to the interface bond 64 during storage and packaging.

The external conditioned air supply, not shown, can be a separate heating or cooling/dehumidification unit or a unified system and forms no part of the invention. The air supplies are typically transportable low pressure units, similar to a hair dryer construction or the like, having a moderate volume flow rate for which the orifices 20 are sized. The air supply is connected to the blanket by means of the flexible hose 44 as described below.

The pneumatic blanket 10 is typically used to adjust or maintain patient body temperatures through the application of either warming or cooling air for surgical, post operative, hypothermic or hyperthermic patients. In use, pneumatic blanket 10 is fully opened and positioned to cover the body area to be treated; if the whole body is to be covered, then the blanket is positioned lengthwise over the patient with the fitting plate 46 adjacent the patient's feet. Next, the fitting plate 46, which has been folded during storage, is grasped with appropriate fingers behind the extensions 56 and 58 and the thumb or thumbs are positioned at the plate fold line 60 on the outer surface of the plate. By pressing inwardly on the plate fold line 60 while separating extensions 56 and 58 the fitting plate may be opened to a substantially vertical planar configuration as shown in FIG. 4. Next, while maintaining pressure on the fitting plate 46 such that it is in the open, planar configuration the air supply nozzle 38 is inserted into the fitting plate central opening 54 until a snug sealed fit between the plate 46 and the nozzle 38 is obtained as in FIG. 4. Of course, the size of the nozzle 38 and opening 54 are such that the nozzle will tightly wedge into the opening 54 to form an effective seal. Conditioned air may now be supplied to the nozzle which will inflate the blanket and cause the air within the blanket 10 to be exhausted through the blanket orifices 20 in the blanket bottom. By bathing the patient in a constant, gentle flow of air the desired body temperature effect may be achieved without the tissue damage or discomfort often caused by indirect or direct contact with a heat exchanging member.

It is appreciated that various modifications to the inventive concepts may be apparent to those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A pneumatic, disposable, temperature control blanket receiving conditioned air through an external air supply connection means, comprising, in combination, an upper thermoplastic air impervious flexible sheet and a lower thermoplastic flexible sheet each having a first end, an opposing second end and edges defining a periphery, said first end lower flexible sheet being adjacent said first end upper flexible sheet, said lower sheet having a lower bottom surface, a heat seal bonding said upper flexible sheet periphery to said lower flexible sheet periphery, a pneumatic flow chamber defined by said sheets, said upper flexible sheet being heat sealed to said lower flexible sheet at a multitude of staking points distributed in a staggered pattern within said sheets' peripheral edges thereby defining redundant multiple air flow paths within said pneumatic flow chamber, an inlet air port defined in said pneumatic flow chamber, an inlet air connection means affixed to said sheets in communication with said inlet air port adapted to receive the inlet air supply connection means to inflate said pneumatic flow chamber, an outer fibrous bottom lamina material bonded to said lower flexible sheet

bottom surface thereby comprising a lower laminated assembly to provide a slide resistant comfortable patient contact surface, an outwardly disposed air flow orifice array defined in said laminated assembly in communication with said pneumatic flow chamber to convey temperature controlled air from said pneumatic flow chamber to the patient, said orifice array comprising a plurality of substantially evenly spaced openings defined in said laminated assembly sized to maintain a predetermined pneumatic flow chamber pressure over a range of predetermined air source volume flow rates.

2. A pneumatic, disposable, temperature control blanket as in claim 1, wherein said inlet air connection means comprises a folding plate affixed to said sheets adjacent said edges thereof defining an opening in communication with said inlet air port adapted to receive the air supply connection means.

3. A pneumatic, disposable, temperature control blanket receiving conditioned air through an external air supply connection means, comprising, in combination, an upper flexible sheet and a lower flexible sheet each having a first end, an opposing second end and edges defining a periphery, said first end lower flexible sheet being adjacent said first end upper flexible sheet, a peripheral bonding means bonding said upper flexible sheet periphery to said lower flexible sheet periphery, a pneumatic flow chamber defined by said sheets having walls, an inlet air port defined in said pneumatic flow chamber, an inlet air connection means affixed to said sheets in communication with said inlet air port adapted to receive the inlet air supply connection means to inflate said pneumatic flow chamber, an outer fibrous bottom lamina material bonded to said lower flexible sheet thereby comprising a laminated assembly to provide a slide resistant comfortable patient contact surface, an outwardly disposed air flow orifice array defined in said laminated assembly in communication with said pneumatic flow chamber to convey temperature controlled air from said pneumatic flow chamber to the patient, said orifice array comprising a plurality of openings sized to maintain pneumatic flow chamber pressure over a range of air source volume flow rates, said inlet connection means comprising an articulating fitting plate having a folded mode and an unfolded inflation mode, an opening defined in said fitting plate in communication with said port adapted to sealingly receive the air supply connection means when said plate is in said unfolded mode, said fitting plate being attached to said upper flexible sheet first end and said lower flexible sheet first end, said inlet air port and fitting plate being located intermediate said upper and lower flexible sheets at said sheet's edges to permit the introduction of supply air in said chamber in the direction of the general plane of the blanket minimizing flow restrictions.

4. A pneumatic, disposable, temperature control blanket for receiving conditioned air through an external air supply nozzle, comprising, in combination, a substantially planar chamber having a flexible upper wall, a flexible lower wall and an edge, a port communicating with said chamber defined in said edge, a folding fitting plate affixed to said upper and lower walls having a central opening in communication with said port, said fitting plate having a fold line in alignment with said chamber edge, said fitting plate central opening adapted to slidably, sealingly receive the air supply nozzle in the blanket plane upon said plate being unfolded, an orifice array defined in said lower chamber wall, said orifices being in communication with said chamber

7

outwardly disposed to discharge chamber air onto the patient.

5. A pneumatic, disposable, temperature control blanket as in claim 4, wherein said fitting plate comprises an elongated member having a first end defining a first end extension, a second end defining a second end extension and a circular portion intermediate said first and second ends, said circular portion having a central opening defined therein in alignment with said port, adapted to receive the air supply nozzle.

6. A pneumatic, disposable, temperature control blanket as in claim 5, wherein said fitting plate circular portion only is sealingly bonded to said flexible upper wall and said flexible lower wall at said blanket edge

8

thereby leaving said plate extensions free to move relative said blanket, said circular portion central opening adapted to align and communicate with said port.

7. A pneumatic, disposable, temperature control blanket as in claim 5, wherein said fitting plate is fabricated of a flexible, foldable material with an outer surface adapted to receive indicia thereon.

8. A pneumatic, disposable, temperature control blanket as in claim 7, indicia located on said fitting plate outer surface for explanatory and orientation purposes.

9. A pneumatic, disposable, temperature control blanket as in claim 7, wherein said fitting plate material is cardboard.

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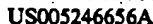
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[11] Patent Number: 5,246,656

[45] Date of Patent: Sep. 21, 1993

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|-----------|---------|-------------------|----------|
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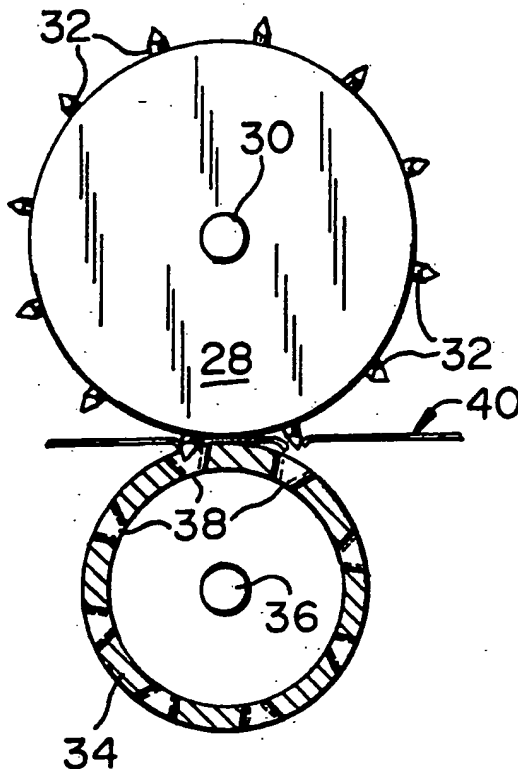
Primary Examiner—Jay H. Woo
Assistant Examiner—Duane S. Smith
Attorney, Agent, or Firm—Beaman & Beaman

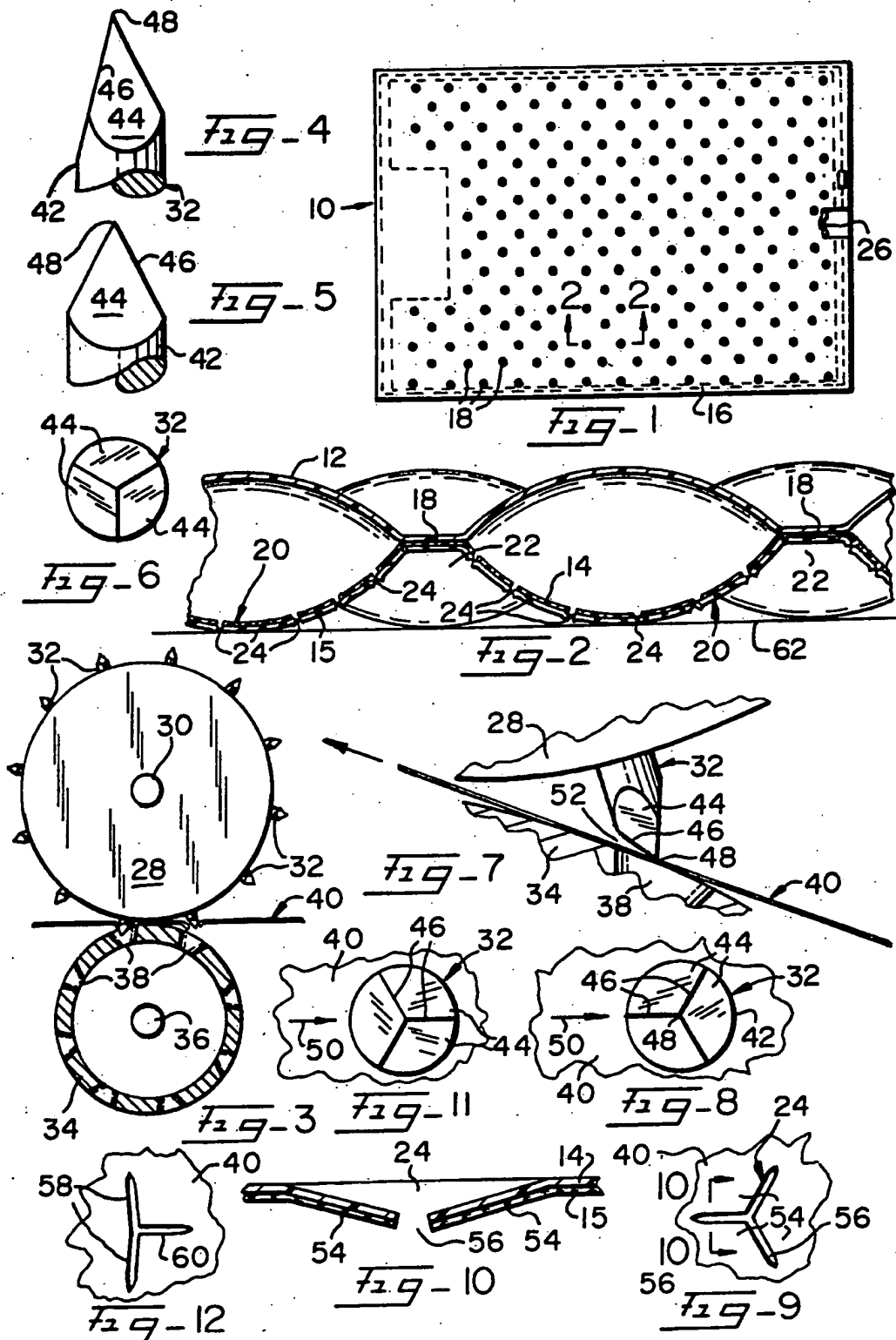
[57] **ABSTRACT**

The invention pertains to the method for forming air flow control orifices in a patient body temperature regulating blanket consisting of an inflated envelope defined by thin plastic film wherein temperature controlled air flows through the blanket orifices upon the patient's body. The blanket side disposed toward the patient is pierced by a sharp pointed punch having a plurality of intersecting facets defining sharpened intersecting edges. The punch apex and facet intersecting edges are related to the moving film in such a manner that the penetration of the punch forms a plurality of flexible valve flaps, and the valve flaps engaging the patient's body will be retained in a closed condition to restrain air flow through those orifices engaging the body to prevent exposure to excessive air temperatures.

6 Claims, 1 Drawing Sheet

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METHOD FOR FORMING AIR FLOW CONTROL ORIFICE IN AN INFLATED BLANKET

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention pertains to the forming of air flow control orifices in a film or web by the use of a multiple faceted sharp punch wherein the punch forms a plurality of flexible valve flaps which define the orifice.

2. Description of the Related Art

Post-surgery medical patients often experience body temperature fluctuations, and a treatment for such conditions includes covering the patient's body with a thermal blanket. The thermal blanket may be inflated with a warm pressurized air, and orifices formed in the blanket side disposed toward the patient permit the warm air to be discharged from the blanket envelope upon the patient. Such a single use patient warming blanket is shown in the assignee's U.S. Pat. No. 5,125,238.

As will be appreciated from the above identified patent, the lower side of the blanket disposed toward the patient is provided with a plurality of orifices through which the warm air flows toward the patient. Preferably, the blanket lower side outer surface is provided with a non-woven, fibrous layer which, though thin, is sufficient to increase the frictional characteristics of the blanket envelope forming material, which is usually a thin plastic film of a flexible nature.

Usually, the warming blanket is directly placed upon the patient's body wherein the lower blanket surface, i.e. the non-woven material, will directly engage the patient's body. As disclosed in the assignee's above identified patent, the blanket is formed of a plurality of cells by heat sealing the blanket envelope upper and lower films at spaced locations resulting in a blanket form having a plurality of projections or protrusions intermediate recesses or depressions located adjacent the film welded or staked points.

The air control orifices formed in the blanket lower film and non-woven material are usually evenly spaced over the lower surface of the blanket, and some of the orifices will be defined at the lowermost regions of the bulbous projections which directly engage the patient's body. Accordingly, air flowing from such orifices in direct engagement with the patient's body will tend to impose a higher temperature air upon the patient's body than the air discharged from the orifices formed in the blanket recesses which are spaced from the patient's body permitting the air to be diffused, cooled and distributed prior to engaging the patient's body.

Heretofore, the orifices of a patient warming blanket have not been capable of automatically sensing the presence of the patient's body and preventing direct exposure of the air released from the blanket.

SUMMARY OF THE INVENTION

Objects of the Invention

It is an object of the invention to provide a method of forming an air flow control orifice in an inflated blanket wherein air flow from orifices directly in contact with the patient's body will be restricted.

Another object of the invention is to provide a method for forming an air flow control orifice in an inflated blanket wherein the orifices are defined by a plurality of flexible valve flaps capable of automatically

closing under the influence of external pressures to restrict air flow from the orifice.

Yet another object of the invention is to provide a method of controlling the flow of air from an inflated blanket wherein air flow is through a plurality of orifices, each of the orifices including a plurality of flexible valve flaps capable of automatically closing when directly engaging the patient's body to restrict air flow from such orifices.

An additional object of the invention is to provide a method for punching air flow control orifices in a thin film or web wherein the orifices are defined by a plurality of flexible valve flaps of substantially identical configuration.

In the practice of the invention, a patient warming, or cooling, blanket is formed by a pair of flexible thermoplastic sheets of film heat sealed at their periphery, and at spaced internal locations to define an envelope. A fitting communicating with the blanket envelope interior permits pressurized air to be supplied to the blanket for inflation purposes. The lower side of the blanket, i.e. the blanket side disposed toward the patient covered by the blanket, includes an outer non-woven fibrous material to provide a friction surface, and the lamination of the fibrous material and the lower film is provided with a plurality of air flow control orifices through which the air within the blanket is directed toward the patient and bed supporting the patient.

The air flow control orifices are punched into the blanket lower surface film and non-woven material by a sharp punch having an apex defined by a plurality of intersecting facets. Preferably, the facets are planar, three in number arranged at equal 120° spacings about the longitudinal axis of the punch, and intersecting each other to define sharp linear intersecting edges.

The punch facets and intersecting edges are related to the direction of travel of the film or web to be punched such that a linear edge is aligned with, i.e. parallel to, the direction of movement of the film as it passes between a roller carrying a plurality of punches, and a back-up or support roller which supports the film as it is being punched. By so relating the punch intersecting edge to the direction of film movement, an air control orifice is defined in the film and non-woven material which consists of three intersecting slits disposed at 120° to each other and the film and non-woven material intermediate the slits defines flexible identical valve flaps which, when maintained in a plane substantially equal to the normal plane of the associated blanket surface, substantially closes the associated orifice to air flow therethrough. Such a relationship occurs when the orifice is directly engaging the patient's body such that the patient's body engages the valve flaps and maintains the valve flaps within the plane of the orifice.

Accordingly, by forming the air flow control orifices in an inflatable blanket in accord with the invention, direct exposure of the patient's body to warm air due to the orifice touching the patient's body is minimized, and the orifices of the invention permit a patient warming blanket to be economically formed which is capable of automatically controlling the air flow upon the patient.

BRIEF DESCRIPTION OF THE DRAWING

The aforementioned objects and advantages of the invention will be appreciated from the following description and accompanying drawings wherein:

FIG. 1 is a top plan view of a patient warming blanket of the type in which the air flow control orifices of the invention may be defined,

FIG. 2 is an enlarged detail elevational sectional view as taken along Section 2—2 of FIG. 1,

FIG. 3 is a side elevational, partially schematic, view of the roller apparatus for forming the air control orifices in accord with the invention,

FIG. 4 is a detail view of the punch penetrating end illustrating an intersecting edge,

FIG. 5 is a detail view of the punch intersecting end illustrating a full facet face,

FIG. 6 is an end view of the punch penetrating end,

FIG. 7 is an enlarged detail view illustrating the relationship of the punch to the film upon engagement of the punch apex with the film, and prior to penetration,

FIG. 8 is a schematic view illustrating the end of the orifice forming punch and the relationship of the punch intersecting edges to the direction of film movement during orifice forming,

FIG. 9 is a detail view of an air control orifice formed in accord with the invention by a punch oriented as shown in FIG. 8,

FIG. 10 is an enlarged elevational sectional view of an air control orifice formed in accord with the invention as taken along Section 10—10 of FIG. 9,

FIG. 11 is a view similar to FIG. 8 illustrating a non-preferred orientation of the punch facets to the direction of film movement during penetration, and

FIG. 12 is an enlarged detail illustration of an air flow control orifice if formed by the punch orientation of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A patient warming blanket utilizing the concepts of the invention is shown in FIG. 1, and may be identical to the assignee's blanket as disclosed in U.S. Pat. No. 5,125,238, the disclosure of this patent being incorporated herein. It is to be appreciated that the blanket 10, while usually employed to flow warm air over a patient for body temperature control purposes, may also be used for patient cooling as it is within the concepts of the invention to inflate the blanket 10 with cool air in the event that body cooling is required, and the air flow control orifices of the invention operate identically regardless of the air temperature.

Basically, the blanket 10 consists of an upper synthetic thermoplastic flexible film 12 and a lower film 14 which define an air containable envelope. Preferably, the outer surface of the film 14 has a non-woven material 15 laminated thereto to increase the frictional characteristics of the outer surface of the lower portion of the blanket. The peripheral edge 16 of the blanket 10 is heat sealed to define a closed envelope, and intermediate its periphery the films 12 and 14 are welded or staked together by heat sealing to define a plurality of interconnected cells which form outwardly extending bulbous convex projections 20, FIG. 2, having recesses 22 defined therebetween adjacent the stakes 18.

The lower side of the blanket defined by film 14 and laminated material 15 is provided with a plurality of air flow control orifices 24 substantially evenly spaced over the area of the lower surface of the blanket 10. Heated, or cooled, air is supplied to the interior of the blanket 10 through the inlet fitting 26, and air flows from the orifices 24 upon the patient as later described.

The air flow control orifices 24 are formed by apparatus shown in FIG. 3 consisting of a punch roller 28 rotating about shaft 30. A plurality of radially extending punches 32 extend from the roller 28, and the width of the roller 28 will be substantially equal to the width of the blanket, i.e. the vertical height of the blanket 10 as illustrated in FIG. 1.

A back-up roller 34 rotates about a shaft 36 which is parallel to shaft 30, and the back-up roller 34 includes a plurality of holes 38 for receiving the punches 32 as the rollers 28 and 34 rotate in synchronization so that the punches 32 are properly received within the holes 38.

The film 40, FIG. 3, which is used to define the lower side of the blanket 10 and consists of the lamination of the film 14 and non-woven material 15, passes between the rollers 28 and 34, and is penetrated by the punches 32 as it passes between the rollers.

The configuration of the punches 32 will be appreciated from FIGS. 4-6 wherein the punches 32 are of a cylindrical configuration having an outer cylindrical surface 42. At the outer ends of the punch, the punch includes a plurality of facets 44 which are preferably planar in configuration and intersect at intersecting edges 46 to define a sharp apex 48.

In the preferred embodiment, three facets 44 are employed which are of identical configuration such that the intersecting edges 46 will be disposed at 120° to each other with respect to the longitudinal axis of the associated punch 32, and the intersecting edges 46 are of a linear configuration defining a sharp cutting edge.

The punches 32 are oriented within the punch roller 28 such that an intersecting facet edge is parallel to the direction of film movement as indicated by the arrow 50, FIG. 8. Also, the diameter of the punch roller 28 and the back-up roller 34, and the length of the punch 32, and the configuration of the facets 44 is such that the initial engagement between the punch 32 and the film 40 is at the punch apex 48 as illustrated in FIG. 7. The angle of the film 40 to the punch is such that the intersecting edge 46 closest to the film 40 will be spaced from the film 40 to define a clearance 52, FIG. 7, at the time that the apex 48 is engaging the film 40. The film 40 will be translated at a velocity equal to the rate of movement of the punches 32 and in a direction parallel to the direction of movement of the punches.

Accordingly, the apex 48 will initially penetrate the film 40 followed by the leading intersecting edge 46 which will cut a slit in the film. Thereafter, as the punch 32 is received within the aligned hole 38 of the back-up roller 34 the "trailing" intersecting edges 46 will penetrate the film or web 40 and also cut slits in the film.

With reference to FIG. 9, the desired air flow control orifice 24 is shown. The orifice 24 consists of a plurality of flexible valve flaps 54 formed of the material of the film 40 as defined by the slits 56 which are the slits cut in the film by the punch intersecting edges 46. In FIG. 9 the width of the slits 56 is exaggerated for purpose of illustration.

As will be appreciated from FIG. 9, by aligning the punch intersecting edges 46 to the direction of film movement 50 as shown in FIG. 8, the valve flaps 54 will be of identical configuration each defining a 120° included angle. A side view of the air flow control orifice 24 as shown in FIG. 9 appears in FIG. 10 wherein the valve flaps 54 are slightly downwardly deflected. The resilient nature of the film 40 tends to normally maintain the valve flaps 54 substantially parallel to the unpunctured adjacent portion of the film 40 as defined by the

film layer 14 and the non-woven material 15, and the presence of the pressurized air within the blanket 10 will cause the valve flaps 54 to outwardly deflect as shown in FIG. 10 permitting air to pass through the slits 56.

By forming the air flow control orifices 24 in the aforescribed manner, those orifices 24 which are directly engaging the patient's body as represented at 62 in FIG. 2, will be maintained "closed", i.e. substantially parallel to the film 14 and material 15 substantially eliminating the flow of air through the orifice directly against the patient's body. This closing of the orifices 24 directly engaging the patient's body 62 will prevent "hot spots" upon the body with the attendant possible discomfort. However, those orifices 24 located within the recesses 22 above the body 62 will not be engaging the body and the valve flaps 54 thereof will outwardly deform as shown in FIG. 10 permitting the air within the blanket envelope to flow through the slits 56 warming the body, and yet the distance of those orifices 24 from the body through which air is flowing is sufficient to prevent localized temperature "hot spots" and the use of flow control orifices 24 in accord with the invention permits the blanket 10 to provide a more uniform and comfortable heating of the body than previous constructions.

If the punch 32 is oriented to the direction of movement of film 40 as indicated at 50 in FIG. 11 wherein the leading intersecting edges 46 which initially engage the film 40 are obliquely disposed to the direction of film travel the resulting valve flaps as defined by the intersecting edges will not be equal. FIG. 12 represents the orientation of the slots defined in the film 40 if the punch intersecting edges 46 are oriented as shown in FIG. 11. In such instance, the slits 58 defined by the leading intersecting edges 48 will be substantially in alignment, while the trailing intersecting edge 46 will define a slit 60. As clearly apparent from FIG. 12 identical film portions intermediate the slots 58 and 60 do not exist and the symmetry and uniformity of valve flap forming achieved with the arrangement illustrated in FIGS. 8 and 9 is not attained. Accordingly, the orientation of the punch intersecting edges shown in FIG. 8 is strongly preferred wherein the leading intersecting edge 46 is parallel to the direction of film movement during penetration of the film by the punch 32.

A patient body temperature control blanket 10 utilizing air flow control orifices 24 formed in the described manner overcomes many of the problems attendant with previous patient warming blankets and it is appreciated that various modifications to the inventive concepts may be apparent to those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. The method of forming an air flow control orifice in an inflated blanket to be placed upon a patient's body having a body engaging side defined by a thin flexible material comprising the step of:

a) puncturing a plurality of spaced orifices in the body engaging side defined by a plurality of radially related slits to define orifices each formed by a normally closed an opening consisting of a plurality of flexible valve flaps having flexible ends said valve flaps pivoting to an open air flow position out of the opening upon the blanket being inflated if in non-engagement with the patient's body associated with the blanket and said valve flaps being retained in an airflow restrictive position within the opening if in engagement with the patient's body associated with the blanket.

2. The method of forming an air flow control orifice as in claim 1 wherein the orifice is defined by three valve flaps.

3. The method of puncturing a thin web of flexible material to define an air flow control orifice formed by a plurality of flexible valve flaps formed of the flexible material using a pointed punch having an apex defined by a plurality of elongated facets converging toward the apex and intersecting in sharp facet edges each having a length comprising the steps of:

a) translating the web of flexible material in a given direction of movement at a given linear velocity.
b) rotating the punch about an axis whereby the punch apex is translating through an arc at a velocity substantially equal to the web linear velocity and in a direction parallel to said web given direction of movement,
c) disposing an elongated punch facet edge in a direction parallel to and opposite to said web given direction of movement and toward the approaching web, and
d) penetrating the web with the punch apex and facet edges whereby the punch facet edges define elongated slits in the web which define the flexible valve flaps, the configuration and spacing of the valve flaps corresponding to the spacing of the facet edges and a slit being parallel to said web given direction of movement.

4. In the method of puncturing a thin web as in claim 3, three facets being defined upon the punch.

5. In the method of puncturing a thin web as in claim 4, said facet edges being spaced 120° about the longitudinal axis of the punch.

6. In the method of puncturing a thin web as in claim 3 comprising the step of orienting and angularly relating the punch apex to the web prior to penetration of the web such that the punch apex engages the web prior to the web being engaged by a facet edge whereby the web is initially penetrated by the punch apex.

* * * * *

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:)	
)	
SCOTT D. AUGUSTINE, ET AL.)	Group No.: 3304
)	
Serial No.: 08/386,324)	
)	Examiner: M. Graham
Filed: February 10, 1995)	
)	
For: THERMAL BLANKET)	

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

**DECLARATION OF R. ANDREAS DEIBEL
UNDER 37 CFR 1.132**

I, R. ANDREAS DEIBEL, a citizen of the United States, residing in Minneapolis, Minnesota, declare as follows:

1. that I have held the position of automation engineering manager for AUGUSTINE MEDICAL, INC., since 1994, and that from 1990-1994, I held the position of automation design engineer for AUGUSTINE MEDICAL, INC.;
2. that I am familiar with the identified U.S. patent application and with the structure and manufacture of inflatable thermal blankets of the type disclosed and claimed in the identified U.S. patent application;
3. that, as automation engineering manager, I am responsible for designing, maintaining, and overseeing the operation of automated production equipment that is used to manufacture inflatable thermal blankets of the type disclosed and claimed in the identified U.S. patent application;

4. that as shown in the attached video, Exhibit "H", difficulties are encountered in heat sealing two plastic sheets to form inflatable thermal blankets due to melting and adherence of the plastic to heat rollers in the automated production equipment. Lower temperature on the heat rollers would not solve the problem since the temperature at which bonding occurs is also the temperature at which the adherence begins. Other bonding techniques, such as RF sealing and ultrasonic sealing, are cost prohibitive due to the high equipment costs. The use of thicker plastic is not feasible since the thickness required to overcome the sticking problem would result in a thermal blanket that is too bulky, thick and expensive to be commercially feasible. I know of no other method by which these two plastic sheets can be heat sealed quickly, easily and cheaply other than by incorporating the fibrous base sheet of the present invention;

5. that the laminated structure of the thermal blanket described and claimed in this U.S. patent application solves these problems as follows. The structure of the base sheet having a first layer of a base sheet material (a four mil thick layer of fibrous material) and a second layer of a second base sheet material (a one-half mil thick sheet of polypropylene) laminated together makes feasible the automated manufacturing of this blanket. This is because the first layer of material provides a base on which the bonding of the overlaying flexible material sheet (another one-half mil thick sheet of polypropylene) to the second base sheet can be supported during bonding without requiring the heat source to directly contact either of the two plastic sheets. That is, the heat source makes contact only with the fibrous layer which conducts heat to the plastic layers without itself being affected. This permits the plastic sheets to bond. Furthermore, the bottom fibrous layer provides a stiff support layer which facilitates registration and handling of the various sheets of the